AF900PC

Air/Fuel Ratio Control System

Installation and Operating Guide

DYNALCO

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Revision E 01/30/2012

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1. Introduction to the AF900PC

The AF-900PC is a state-of-the-art air/fuel ratio control system for single/dual bank, spark-ignited, natural gas fueled carbureted engines. The AF-900PC incorporates an extensive suite of advanced features that intelligently compensate for real-world sensor and engine conditions.

This sophisticated system maintains the percentage of oxygen (O_2) in the engine's exhaust gas stream by adjusting the amount of fuel to the carburetor(s). Fuel valves mounted between the regulator and carburetor adjust the fuel pressure applied to the carburetor to maintain the desired air/fuel ratio. The AF900PC is designed to work with rich-burn engine systems using 3-way or NSCR type catalytic converters.

In these applications it is very important to maintain air/fuel ratio to avoid damage to the converter, prevent engine damage when fuel BTU content variations cause the engine to run very rich or lean, and ultimately enable the engine to reduce emissions.

2. Theory of Operation

Utilizing heated O2 sensor(s) in the exhaust stream (one per bank), the AF-900PC provides PWM outputs to full-authority fuel valves in order to accurately control air/fuel ratio over a wide load range. The O_2 sensor operates best slightly rich or lean of a point called stoichiometric, which is an A/F ratio of 16.09:1 for natural gas. Engines with catalytic converters should be run slightly rich of stoichiometric for lowest emissions.

The AF900PC implements compensation through an intelligent closed-loop algorithm which provides smooth control behavior that is adaptable to changing engine load, speed, fuel quality, ambient temperature and catalytic converter conditions.

In addition, the AF900PC offers optional intake manifold pressure sensor(s) capability for further adjustment of the post-catalytic setpoints, allowing the catalytic converter to maintain emissions over an even wider range of engine loads and operating conditions.

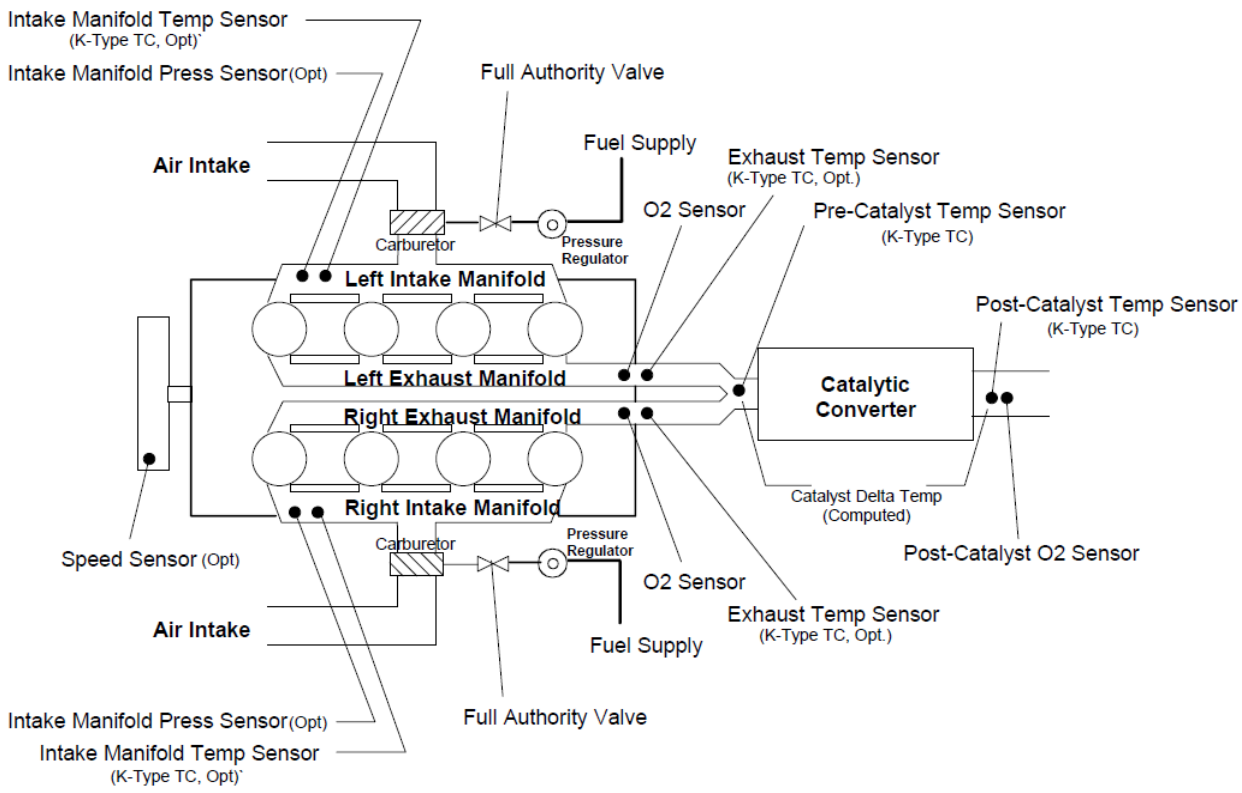
The AF900PC system monitors the proper operation of all sensor inputs and controller outputs, flagging errors and changing its operating mode when a fault is detected.

Equipped with a powerful onboard data logging feature and real-time clock, the AF900PC has the ability to log controller conditions at either pre-determined times of day or on a time interval basis. This allows users to automatically capture and store diagnostic errors and overall system performance internally over any given period of time. It also aids in troubleshooting hard to catch intermittent system problems.

The MODBUS communications capability allows remote monitoring of system performance and status.

3. System Diagram

AF900PC
Engine Diagram



4. Specifications

Inputs	Left Bank O_2 Sensor (heated) Right Bank O_2 Sensor (heated) RPM Input (Magnetic Pickup) RPM Status (Contact Closure)
Controller Outputs	Left Bank Output (PWM) Right Bank Output (PWM)
Relay Outputs	3 Relays, SPDT, rated @ 5A/24VDC, 1A/120VAC, and 0.5A/220VAC
Input Power	10 – 30 VDC @ 70 Watts Input Power to AF900PC controller
Sensor Power Out	+ 8 VDC Active Magnetic Pickup Sensor Power
Display	Backlit, 4 Line x 20 Character Alphanumeric Display with large 0.36” Characters
Data Logging	Internal 64M Flash Memory and Windows Based DynaTrend Software to transfer the data to a laptop for viewing and graphing
Communications	Hardware: RS-232 / RS-485 Software: DynaHost Laptop Configuration Modbus
Connections	All Two-Part Terminal Blocks
Operating Temperature Range	- 30 to + 80 Deg C
Certification	CSA Class I, Division 2, Groups A, B, C, D

5. Components/Installation Summary

5.1 System Components

Included

		Single Bank	Dual Bank
AF-900PC-3F	Air/Fuel Ratio Controller	(1)	(1)
400A-12959	Pre-Cat O2 Sensor Cable Ass'y (50 ft)	(1)	(2)
400A-12064	Post-Cat O2 Sensor Cable Ass'y (100 ft)	(1)	(1)

External Components (purchase separately)

Heated Pre-Cat Oxygen Sensor (Bosch p/n 15718)	(1)	(2)
Full-Authority Fuel Valve	(1)	(2)

Optional External Components (purchase separately)

M201	Magnetic Pickup for speed sensing	(1)	(1)
C101-XX	Pickup Cable for M201	(1)	(1)
Heated Post-Cat Oxygen Sensor (Bosch p/n 15718)		(1)	(1)
K type thermocouples (ungrounded)		(2)	(2)

5.2 Installation Summary

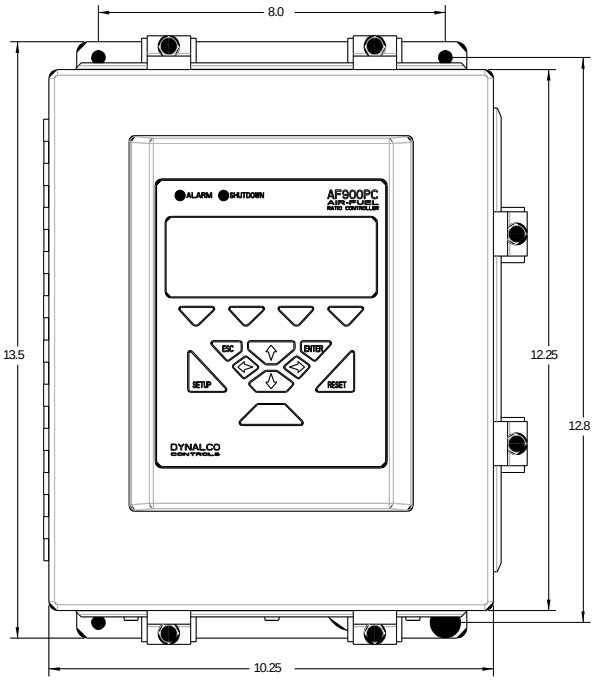
1. Mount AF900PC Controller
2. Install Oxygen Sensor(s) in each engine exhaust bank
3. Run cables for Oxygen Sensors to controller (conduit must be used for Division 2 certification).
4. Install full-authority fuel valve(s)
5. Wire power to controller (10-30 VDC)
6. Install pickup for engine run signal and wire to controller. (Note: A contact closure run signal may be used instead of the magnetic pickup).
7. Wire controller Alarm, Shutdown, and Auxiliary relay outputs to engine panel shutdown and warning devices as required.

6. Installation Details

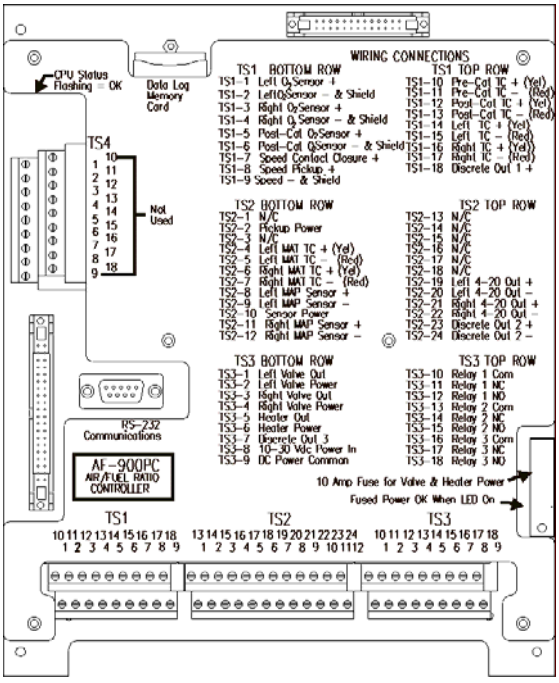
6.1 Mounting the AF900PC Controller

The AF900PC Controller (Fig. 1) should be mounted at “eye level” in an accessible location for easy display and keypad interface. The controller must be mounted in surroundings where vibration is minimal and the ambient temperature does not exceed 80 Deg C. A typical mounting location is on the side of the engine control panel. A shock mount kit should always be used while mounting. All wiring enters the controller through the bottom of the enclosure. There are three holes for ½” conduit entry. All wiring is connected to the main board using removable terminal blocks for ease of wiring and controller replacement.

NOTE: Installation requires four mounting holes.



Front View



Inside View

AF900PC
Air/Fuel Ratio Control System
Fig. 1

6.2 Mounting the Heated Oxygen Sensor(s)

The heated oxygen sensor(s) should be mounted in the exhaust pipe as close to the engine exhaust manifold as possible. A single bank engine requires only one sensor. For dual bank "V" engines, the left and right bank sensors should be mounted as close to the engine exhaust manifold as possible to eliminate cross talk between the two banks.

CAUTION: The sensor(s) must be mounted where the temperature on the outer shell does not exceed 400^{O} F (204^{O} C).

Above 400^{o}F, sensor life will deteriorate rapidly and output voltage will be affected. The sensor(s) should be mounted on a horizontal plane or above horizontal to keep water from accumulating on the sensor tip. The sensor(s) should also be mounted where they are accessible as sensor replacement is recommended every 2000 hours. It is recommended a fitting with 18mm x 1 ½ internal threads be welded into the exhaust pipe for each sensor to be mounted. This will provide a flat mounting surface for the sensor to avoid exhaust leaks. Sensors should be mounted with an anti-seize compound on the threads.

NOTE: Recommended torque for mounting the sensors is 28 – 38 ft-lbs.

The conduit for the oxygen sensor should be routed to avoid close proximity to high tensions ignition cables and coils to minimize potential EMI interference. Ignition, flow control valve, and power wiring must not be placed in the same conduit with oxygen sensor wiring. The conduit should also be routed where temperature does not exceed 200^{o}F.

6.3 Mounting the K type thermocouples (ungrounded must be used)

Optional thermocouples may be installed in the exhaust pipe to monitor pre and post catalyst temperatures. The AF900PC will also calculate the differential (or delta) temperature to help ensure proper catalyst operation. An NPT tap should be used to tap the hole for the thermocouple. An adjustable fitting on most thermocouple probes will allow proper insertion depth into the exhaust stream. The thermocouples should be connected to the AF900PC terminal block using thermocouple extension wire to eliminate erroneous readings.

6.4 Installation of M-201 Magnetic Pickup for Speed Sensing

The M201 magnetic pickup detects engine speed by sensing flywheel gear teeth as they pass by. The pickup must be mounted on a bracket or flywheel cover so that it is perpendicular to the face of the flywheel teeth it is sensing. The M201 requires a 5/8-18 UNF thread for mounting. The gap between the pickup pole piece and the gear teeth should be set to 0.020" to 0.030". Once the gap has been set, the pickup should be secured with the lock nut. The M201 should be connected to the AF900PC with a C101 pickup cable/connector.

6.5 Installation of the full-authority fuel valves (one per bank)

The full-authority fuel valves are to be mounted between the fuel regulator and carburetor fuel inlet, as close to the carburetor inlet as possible.

7. Wiring the AF900PC Controller

All wiring to the AF900PC enters the controller through three (3) conduit openings in the bottom and connects to three (3) double row terminal strips on the bottom of the controller main board. The terminal strips unplug from the main board for ease of controller wiring and replacement. The main board cover plate shows the location of the terminal strips.

Wiring for terminal strip TS1 should enter through the left conduit opening.

Wiring for terminal strip TS2 should enter through the center conduit opening.

Wiring for terminal strip TS3 should enter through the right conduit opening. This will separate the millivolt signal levels on TS1 and TS2 from the power, output, and relay wiring on TS3.

8. Electrical Connections

The Fuel Valves must be configured for single demand, PWM control, and low side drive.

Terminal Strip TS1 Bottom Row	**Description**
TS1-1	Left Bank Oxygen Sensor Output +
TS1-2	Left O2 Sensor Cable - (Black and Shield)
TS1-3	Right Bank Oxygen Sensor Output +
TS1-4	Right O2 Sensor Cable - (Black and Shield) (DB only)
TS1-5	Post-Catalyst Sensor Cable + (White)
TS1-6	Post-Catalyst Sensor Cable – [Black (paired with white) and shield]
TS1-7	Speed Contact Closure + (Required if speed magnetic pickup is not used)
TS1-8	Speed Magnetic Pickup +
TS1-9	Speed Magnetic Pickup - and shield (for speed contact closure if used)

Terminal Strip TS1 Top Row	Description
TS1-10	Pre-Catalyst Thermocouple + (Yellow)
TS1-11	Pre-Catalyst Thermocouple - (Red)
TS1-12	Post-Catalyst Thermocouple + (Yellow)
TS1-13	Post-Catalyst Thermocouple - (Red)
TS1-14	Left Exhaust Thermocouple + (Yellow)
TS1-15	Left Exhaust Thermocouple - (Red)
TS1-16	Right Exhaust Thermocouple + (Yellow) (DB only)
TS1-17	Right Exhaust Thermocouple - (Red) (DB only)
TS1-18	Not Used

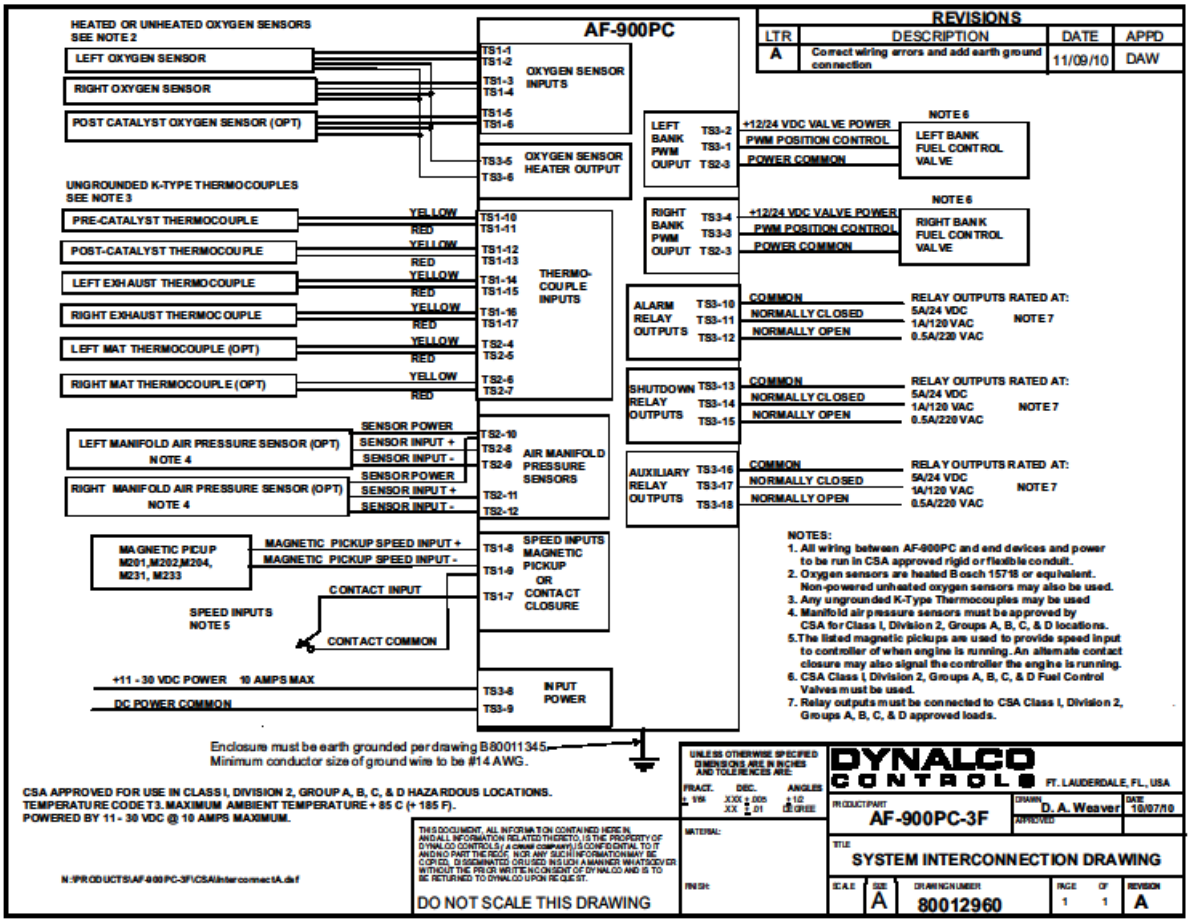
Terminal Strip TS2 Bottom Row	Description
TS2-1	Not Used
TS2-2	+8 VDC Pickup Power for Active Speed Pickup (Optional)
TS2-3	Left & Right Bank Valve Power Common
TS2-4	Left Manifold Air Temperature (MAT) Thermocouple + (Yellow) (Optional)
TS2-5	Left Manifold Air Temperature (MAT) Thermocouple - (Red) (Optional)
TS2-6	Right Manifold Air Temperature (MAT) Thermocouple + (Yellow) (Optional)
TS2-7	Right Manifold Air Temperature (MAT) Thermocouple - (Red) (Optional)
TS2-8	Left Manifold Air Pressure (MAP) Sensor Input (+)
TS2-9	Left Manifold Air Pressure (MAP) Sensor Input (-)
TS2-10	DC Power for Left and Right Manifold Air Pressure (MAP) Sensors (Factory set to Input Supply Voltage but jumper selectable to 5.0 VDC)
TS2-11	Right Manifold Air Pressure (MAP) Sensor Input (+)
TS2-12	Right Manifold Air Pressure (MAP) Sensor Input (-)

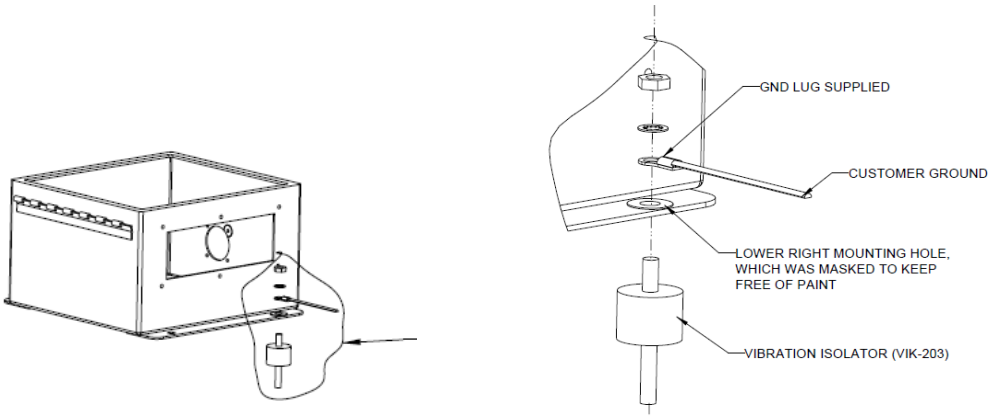
Terminal Strip TS2, Top Row
No Connections Currently Used

Terminal Strip TS3 Bottom Row	Description
TS3-1	Left Bank + PWM Valve Position Control
TS3-2	Left Bank Valve +12/24 DC Power
TS3-3	Right Bank + PWM Valve Position Control
TS3-4	Right Bank Valve +12/24 DC Power / Right Bank Oxygen Sensor Heater -
TS3-5	Left & Right Bank Oxygen Sensor Heater -
TS3-6	Left & Right Bank Oxygen Sensor Heater +
TS3-7	Not Used
TS3-8	+10 to 30 VDC System Power In @ 70 Watts (#16 AWG wire required)
TS3-9	DC Power Common (#16 AWG wire required)

Terminal Strip TS3 Top Row	Description	
	NOTE: Relay contacts are shown in the de-energized state.	
TS3-10	Alarm Relay	Common
TS3-11	Alarm Relay	Normally Closed
TS3-12	Alarm Relay	Normally Open
TS3-13	Shutdown Relay	Common
TS3-14	Shutdown Relay	Normally Closed
TS3-15	Shutdown Relay	Normally Open
TS3-16	Auxiliary Relay	Common
TS3-17	Auxiliary Relay	Normally Closed
TS3-18	Auxiliary Relay	Normally Open

This terminal strip contains the contacts for the alarm, shutdown, and auxiliary relays. These contacts are isolated and may be connected to engine shutdown devices (such as the panel annunciator) or warning devices as required. Any of the AF900PC thirty-nine trip channels may be programmed to energize one of the three relays. The SPDT relay contacts are rated @ 5A/24VDC, 1A/120VAC, and 0.5A/220VAC.


AF-900PC
REVISIONS
LTR DESCRIPTION DATE APPD
A Correct wiring errors and add earth ground connection 11/09/10 DAW
HEATED OR UNHEATED OXYGEN SENSORS SEE NOTE 2
LEFT OXYGEN SENSOR
RIGHT OXYGEN SENSOR
POST CATALYST OXYGEN SENSOR (OPT)
OXYGEN SENSOR INPUTS
OXYGEN SENSOR HEATER OUTPUT
UNGROUNDED K-TYPE THERMOCOUPLES SEE NOTE 3
PRE-CATALYST THERMOCOUPLE
POST-CATALYST THERMOCOUPLE
LEFT EXHAUST THERMOCOUPLE
RIGHT EXHAUST THERMOCOUPLE
LEFT MAT THERMOCOUPLE (OPT)
RIGHT MAT THERMOCOUPLE (OPT)
YELLOW
RED
THERMO-COUPLE INPUTS
LEFT MANIFOLD AIR PRESSURE SENSOR (OPT) NOTE 4
RIGHT MANIFOLD AIR PRESSURE SENSOR (OPT) NOTE 4
SENSOR POWER
SENSOR INPUT +
SENSOR INPUT -
AIR MANIFOLD PRESSURE SENSORS
MAGNETIC PICUP M201,M202,M204, M231, M233
MAGNETIC PICKUP SPEED INPUT +
MAGNETIC PICKUP SPEED INPUT -
CONTACT INPUT
CONTACT COMMON
SPEED INPUTS NOTE 5
SPEED INPUTS MAGNETIC PICKUP OR CONTACT CLOSURE
+11 - 30 VDC POWER 10 AMPS MAX
DC POWER COMMON
INPUT POWER
LEFT BANK PWM OUPUT
RIGHT BANK PWM OUPUT
+12/24 VDC VALVE POWER
PWM POSITION CONTROL
POWER COMMON
NOTE 6
LEFT BANK FUEL CONTROL VALVE
RIGHT BANK FUEL CONTROL VALVE
ALARM RELAY OUTPUTS
SHUTDOWN RELAY OUTPUTS
AUXILIARY RELAY OUTPUTS
COMMON
NORMALLY CLOSED
NORMALLY OPEN
RELAY OUTPUTS RATED AT:
5A/24 VDC
1A/120 VAC
0.5A/220 VAC
NOTE 7
NOTES:
1. All wiring between AF-900PC and end devices and power to be run in CSA approved rigid or flexible conduit.
2. Oxygen sensors are heated Bosch 15718 or equivalent. Non-powered unheated oxygen sensors may also be used.
3. Any ungrounded K-Type Thermocouples may be used
4. Manifold air pressure sensors must be approved by CSA for Class I, Division 2, Groups A, B, C, & D locations.
5. The listed magnetic pickups are used to provide speed input to controller of when engine is running. An alternate contact closure may also signal the controller the engine is running.
6. CSA Class I, Division 2, Groups A, B, C, & D Fuel Control Valves must be used.
7. Relay outputs must be connected to CSA Class I, Division 2, Groups A, B, C, & D approved loads.
Enclosure must be earth grounded per drawing B80011345
Minimum conductor size of ground wire to be #14 AWG.
CSA APPROVED FOR USE IN CLASS I, DIVISION 2, GROUP A, B, C, & D HAZARDOUS LOCATIONS.
TEMPERATURE CODE T3. MAXIMUM AMBIENT TEMPERATURE + 85 C (+ 185 F).
POWERED BY 11 - 30 VDC @ 10 AMPS MAXIMUM.
N:\PRODUCTS\AF-900PC-3F\CSA\InterconnectA.dsf
DO NOT SCALE THIS DRAWING
DYNALCO CONTROLS FT. LAUDERDALE, FL, USA
AF-900PC-3F
D. A. Weaver 10/07/10
SYSTEM INTERCONNECTION DRAWING
80012960
A


GND LUG SUPPLIED
CUSTOMER GROUND
LOWER RIGHT MOUNTING HOLE, WHICH WAS MASKED TO KEEP FREE OF PAINT
VIBRATION ISOLATOR (VIK-203)

9. Front Panel Display User Interface

The AF900PC requires the user to configure a variety of parameters. By performing one of three procedures below, parameters may be configured.

1) Using interface via the SETUP key (password required), keypad, and a 4x20 display.

   NOTE: A limited number of parameters are available in the setup screens of the AF900PC. Using a laptop to configure the AF900PC is recommended.

2) Using DynaHost multiple laptop configuration screens via a laptop or PC.

3) Using DynaHost, a text editor (Windows Wordpad) and editing the downloaded file (AF900PC.SPC) via a laptop or PC.

9.1 Front Panel Configuration Screens

The AF900PC Front Panel Display (FPD) user-interface consists of a 4-row by 20-column LCD display (LCD); a 13-key custom keypad; and two LEDs to indicate ALARM and SHUTDOWN.

9.2 FPD Keypad

The custom keypad consists of the following keys:

Four screen-specific *Soft Keys* are located directly under the **LCD**. These keys navigate to other screens or perform specific actions as indicated in the last line of the **LCD**.

SETUP Key enters **SETUP** Mode.

ESC Key navigates up one menu-level; exits **SETUP** Mode; returns to the Main Title Screen; or cancels certain actions. (Note: To exit **SETUP** Mode or return to Title Screen, the customer must press and hold the **ESC** Key for three or more seconds.)

UP, **DOWN**, **LEFT**, and **RIGHT** Keys select or modify values in **SETUP** Mode.

ENTER Key accepts modified values changed in SETUP Mode.

RESET Key resets **AF900PC** fault conditions.

9.3 FPD Screens

The LCD displays information to the user, grouping the information into screens. Each screen displays a specific set of information to the user. To change screens, the user must navigate to the desired screen using the indicated *Soft Keys*.

The AF900PC will display a title screen upon power up.

DYNALCO CONTROLS
AF900PC

V x.yy

The title screen displays a banner and indicates the current software version for five seconds before displaying a main status screen. To return to the title screen, the user must press and hold the **ESC** key for three seconds.

The main user screens are the Main Status Screen, Pre-Cat Status Screens, Post-Cat Status Screens, Temperature Screens, and MAP Screen. The main status screen displays the current engine/air-fuel control status (**STOPPED, START, MANUAL, AUTO**, etc.) and any current **ALARM** or **SHUTDOWN** fault conditions. The pre-cat status screens display the current pre-cat status and fuel valve opening percentage. The post-cat status screen displays the current post-cat status. The temperature screens display all measured engine temperatures. The MAP screen displays the manifold air pressure(s) and engine RPM.

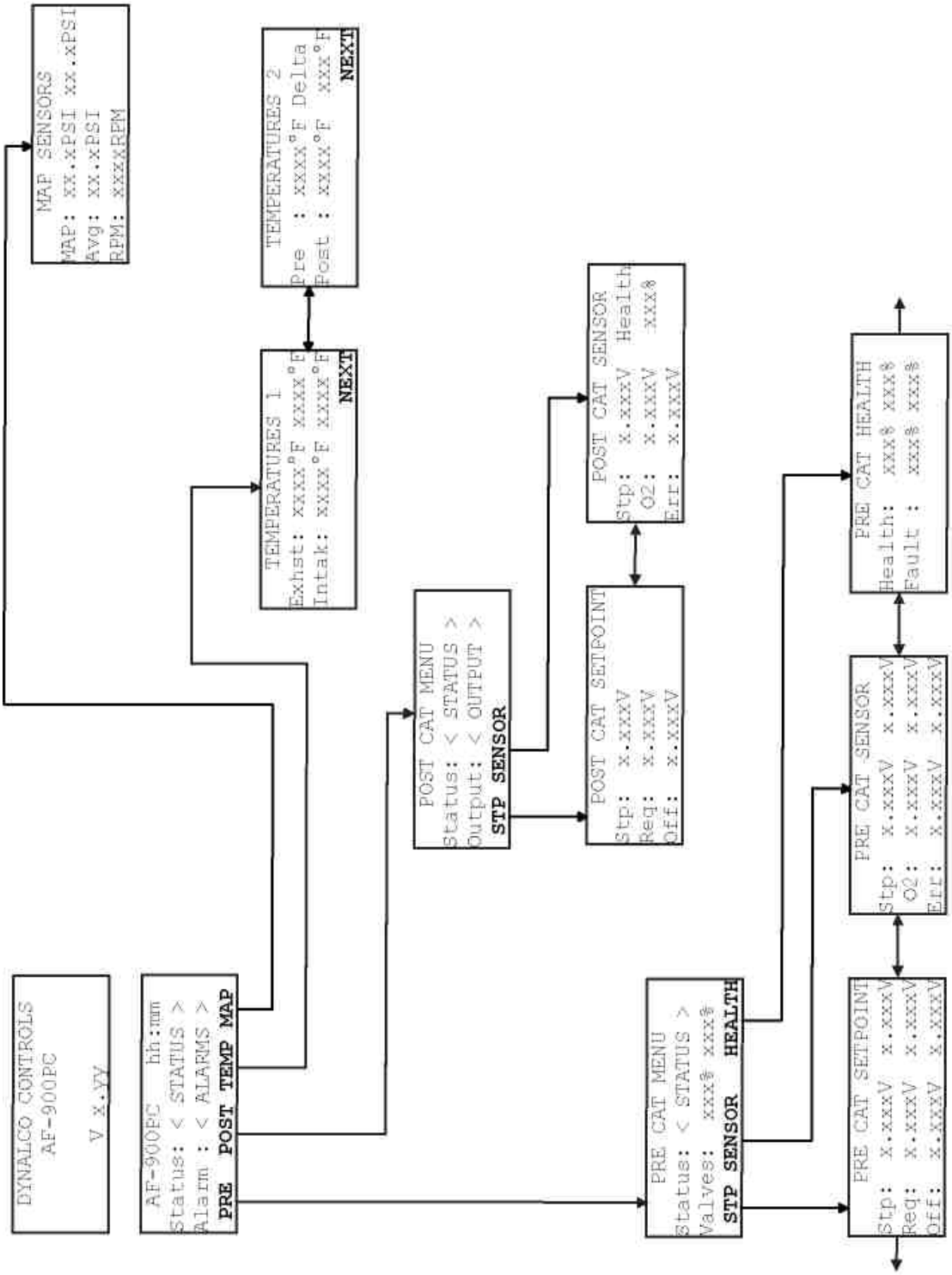
The **SETUP** mode screens allow authorized operators to view and/or adjust software setpoints.

NOTE: Title Screen is not accessible in SETUP Mode.

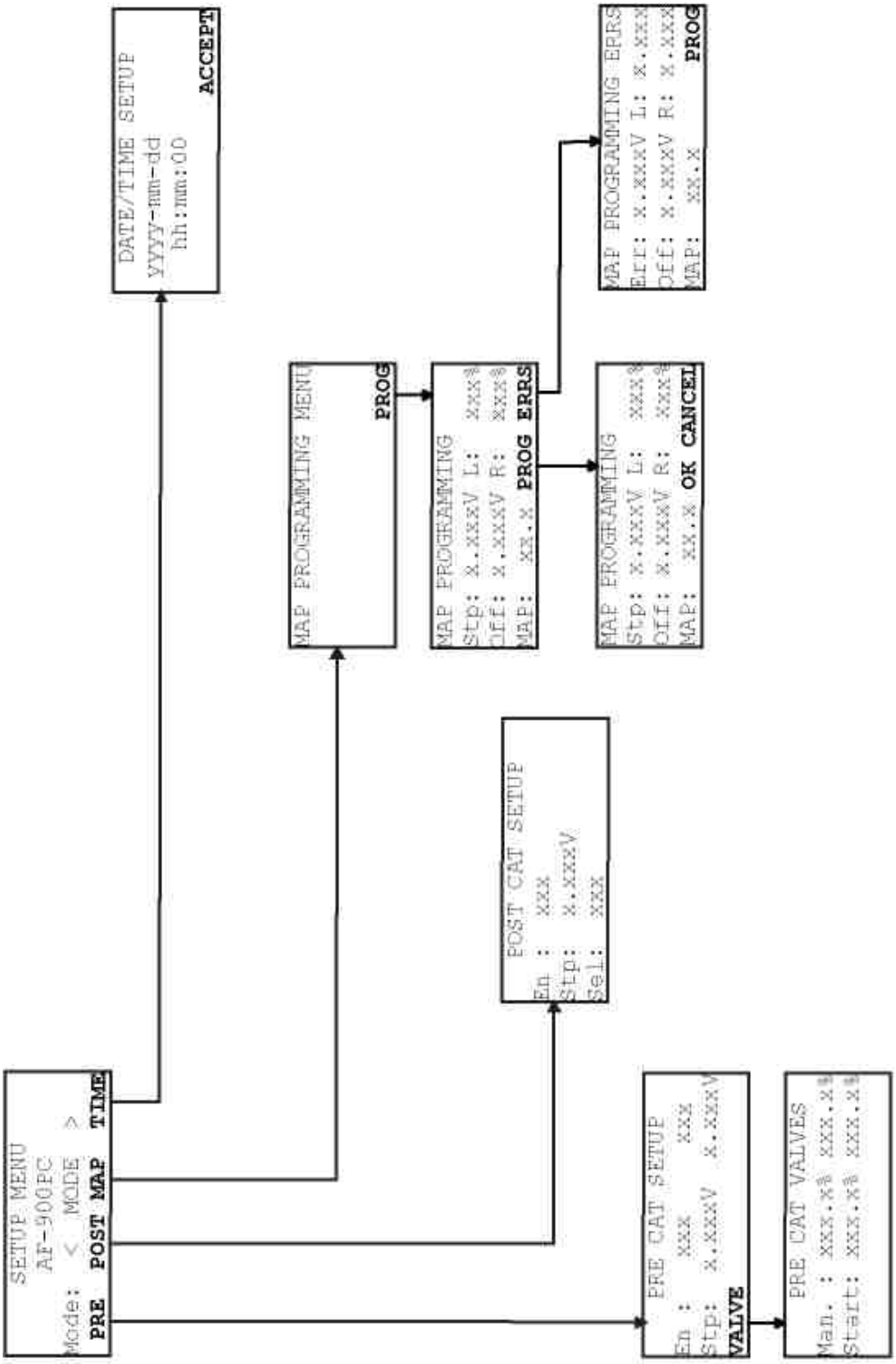
A navigational screen map layout for the user **RUN** screens is shown on page 14.

A navigational screen map layout for the **SETUP** mode screens is shown on page 15.

9.4 Navigational Map of RUN Screens



9.5 Navigational Map of SETUP Mode Screens



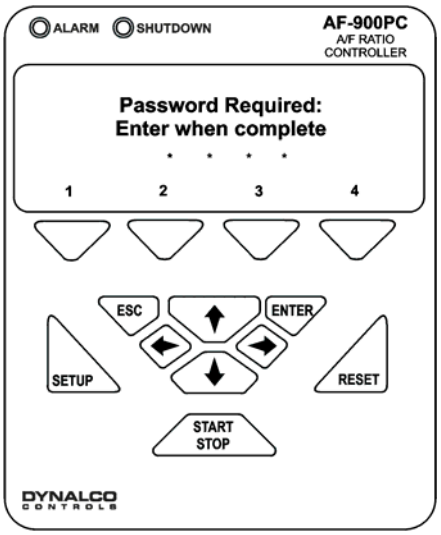
9.6 FPD SETUP Mode

1) To enter **SETUP** mode, press the **SETUP** key on the FPD.

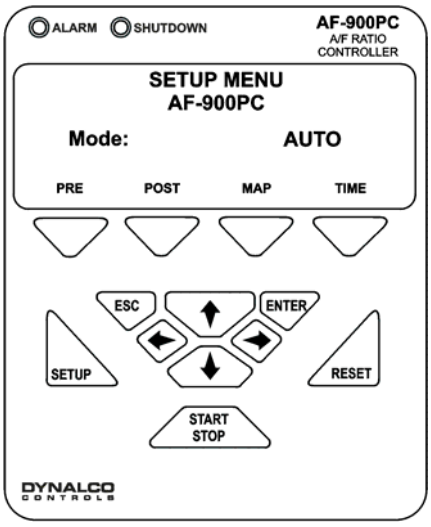
2) Enter current **SETUP** password.

   NOTE: A four character default password "1 2 3 4" is pre-assigned prior to shipping. This password may be changed using the DynaHost software to change parameter 6112.0, if desired. Passwords may be up to eight characters in length using the digits 1, 2, 3, or 4 only.

3) Enter password using the *Soft Keys* labeled "1 2 3 4". A solid asterisk (*) will appear for each entered character, while a blinking asterisk (*) indicates additional characters may be entered.



4) Press **ENTER** for **SETUP** Mode.



From the **SETUP** menu the user may navigate to setpoint screens (screens that allow you to change values) by using the *Soft Keys*. The user may view and/or modify setpoint values as follows:

1. Navigate to the desired setpoint screen.
2. Press the **ENTER** key to enter setpoint select mode. The first setpoint on the screen is now enclosed in angle brackets, i.e. >SETPOINT<.
3. Press the **UP**/**DOWN** keys to select the setpoint to modify. The angle brackets will move from one setpoint to the next for each **UP**/**DOWN** key press.
4. Press the **ENTER** key to enter setpoint modify mode. The bracketed setpoint will blink indicating that the operator may now modify its value.
5. Press the **UP**/**DOWN** keys to increment or decrement the setpoint value. The increment/decrement rate may be changed by selecting the desired rate displayed above the appropriate *Soft Key*.
6. Press the **ENTER** key to save the modified setpoint value; press the **ESC** key to cancel the modified setpoint value and restore the original value.
7. Press the **ESC** key to exit setpoint select mode and return to **SETUP** mode screen navigation.

To exit **SETUP** mode, user must press and hold the **ESC** key for three seconds. All modified setpoint values will be stored to memory while display shows the following:

CONFIGURATION
PARAMETER STORE
IN PROGRESS

Once the **SETUP** configuration is stored to memory, the AF900PC returns to the operator screens.

CAUTION: Power must remain normal during the storing process. A failure of power during "In Process" memory storing will result in the loss of all data storage and will bring the AF900PC back to factory defaults.

10. Computer Interface using DynaHost Software

DynaHost software provides serial communication between a PC or laptop and the AF900PC. DynaHost will run on a PC with 133MHz Intel Pentium processor, 32 MB of RAM, and a minimum of 100MB of hard disk space. DynaHost is compatible with Windows 95/NT/98/2000/XP.

The AF900PC must be connected via a standard RS-232, 9-pin, male-female, serial communication cable. The HOST software communicates to the AF900PC via *Dynalink*, Dynalco Control's ASCII-based serial communication protocol.

When the program is running there are two major sections: the Control Panel and the Current Screen.

10.1 Control Panel Specifications

The Control Panel is located at the top of the application screen on the laptop or PC and allows the user to view the status of the host application, showing the communication settings and status.

Control Panel (Connected)
Figure 1A

The Control Panel above (Fig. 1A) shows an active communication which allows the user to navigate through the multiple screens (Main, O_2 Health, Learn, Data log, Trip 1, Trip 2, AI Config, Pre-Cat Cfg, Post-Cat Cfg, RPM Cfg and DynaTrend).

The Control Panel also contains the basic commands:

- **Power:** Closes the host application.
- **Upload:** Uploads the current configuration of the AF900PC to a configuration file (.spc).
- **Download:** Downloads a configuration file (.spc) to the AF900PC.
- **Store:** Stores the current configuration.
- **Recall:** Recalls the last configuration stored.
- **Cmd:** Sends a command to the AF900PC.
- **Resp:** Shows the response to a command sent to the AF900PC.
- **Screen Buttons:** Show the current screen being displayed and allows you to switch to other screens.

The Control Panel in Fig. B shows an inactive communication by displaying a red "X" across the communication line.

Control Panel (Disconnected)
Figure 1B

10.2 Screen Description

A yellow highlighted button, as shown in Fig. 1B, displays the current screen you are in. Within each screen you can display information by using the following controls:

Toggle Button: Represents 2-state parameters. Place the mouse over the button to the left of text (Figure 2) to see the current state and click on the button to toggle the state. The button will be green when enabled, black when disabled.

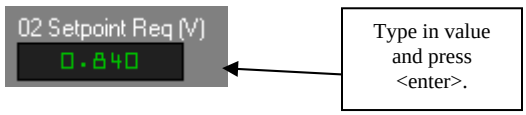
NOTE: The parameter number is displayed when you place the mouse over the label.

(Disabled) **(Enabled)**

Toggle Button
Figure 2

Read/Write Green Display: A parameter (Figure 3) which may be modified by typing a value and pressing **ENTER**.

NOTE: The parameter number is displayed when you place the mouse over the label.



Green Display
Figure 3

Read Only Blue Display: A parameter (Fig. 4) that can only be read.

Blue Display
Figure 4

Combo Box Display: A parameter (Figure 5) modified by selecting one of the options displayed when you click on the drop-down button.

NOTE: The parameter number is displayed when you place the mouse over the label.

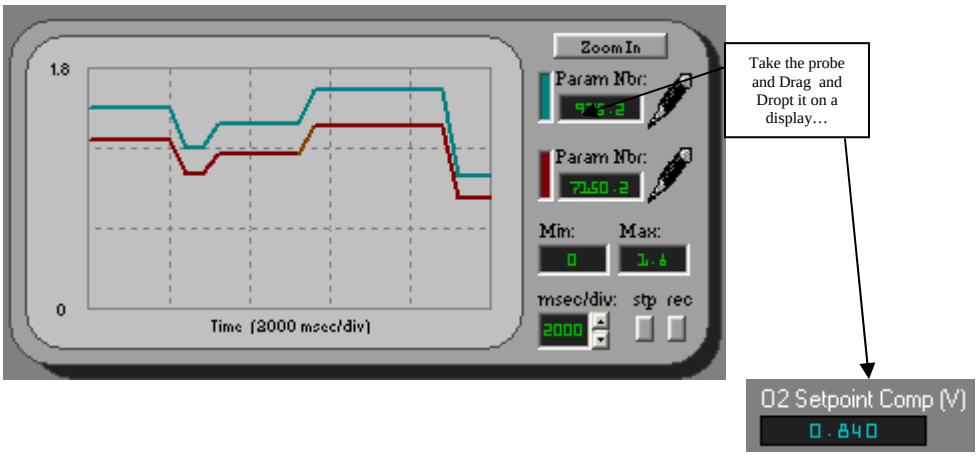
Combo Box Display
Figure 5

Grid Display: A matrix of green displays (Fig. 6). Some parameters may be modified by typing in the value and pressing **ENTER** (press backspace to delete the current value).

	Name	EU	ADC	Test	Raw	Health	Threshold	Filter
Ch. 1	L PRE CAT O2	1.000	65472	5568	100.0	100.0	50.0	0.01
Ch. 2	R PRE CAT O2	1.000	65472	5120	100.0	100.0	54.0	0.01
Ch. 3	POSTCAT O2	1.000	65472	5696	100.0	100.0	50.0	0.01

Grid Display
Figure 6

Scope: Traces the value of up to two numeric parameters in real time domain. The user may select parameters to trace by dragging the probe (Figure 7) and dropping it in the display (blue or green). Minimum and maximum ranges and the time/division may also be changed. The scope may be enlarged to occupy the entire screen by clicking on the zoom in button on the scope. The scope will update much faster when zoomed in because the communications link will request only the two parameters displayed on the scope.



Scope
Figure 7

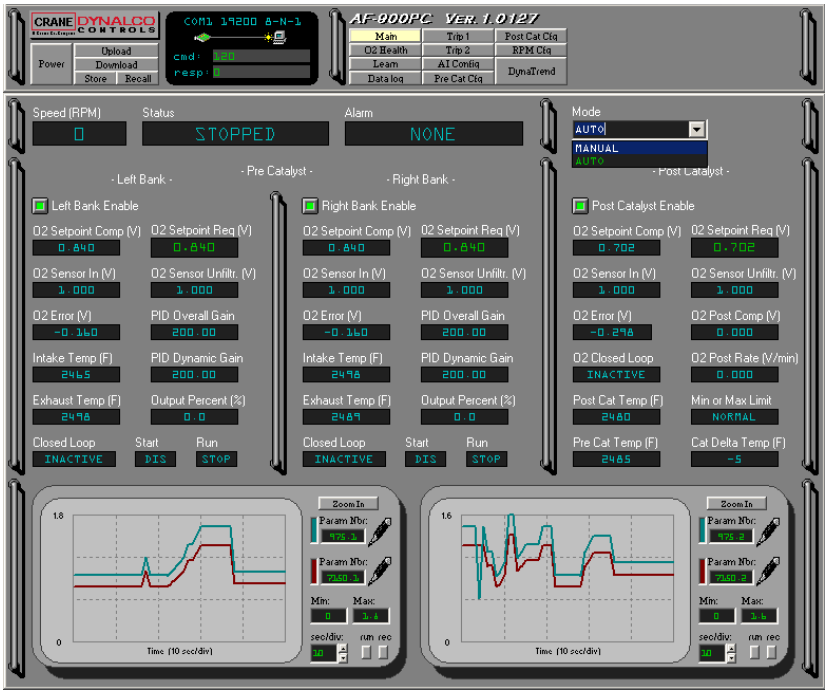
10.3 Main Screen Specifications

MAIN SCREEN

Shows the system and alarm status, the current speed and the main parameters of the pre-catalyst (left and right banks) and post-catalyst (Fig. 8). There are also two scopes to plot up to 4 parameters in real time.

In addition, the following parameters may also be changed from the main screen:

Mode: The controller may be changed between **AUTO** and **MANUAL** mode by clicking on the drop down **MODE** menu and selecting the desired operating mode.
Left and Right Bank O_2 Setpoint Req. (V): The pre-catalyst O_2 initial setpoint request voltage may be changed by clicking into the value, deleting the old value, and entering the new value. Typical operating range is 0.700 to 0.900V.
Post-Catalyst O_2 Setpoint Req. (V): The post-catalyst O_2 initial setpoint request voltage may be changed by clicking into the value, deleting the old value, and entering the new value. Typical operating range is 0.650 to 0.850V
Left Bank, Right Bank, and Post-Catalyst Enable: Left bank, right bank, and post-catalyst control may be enabled or disabled by clicking the **ENABLE** button. If the button is green, the control is enabled.



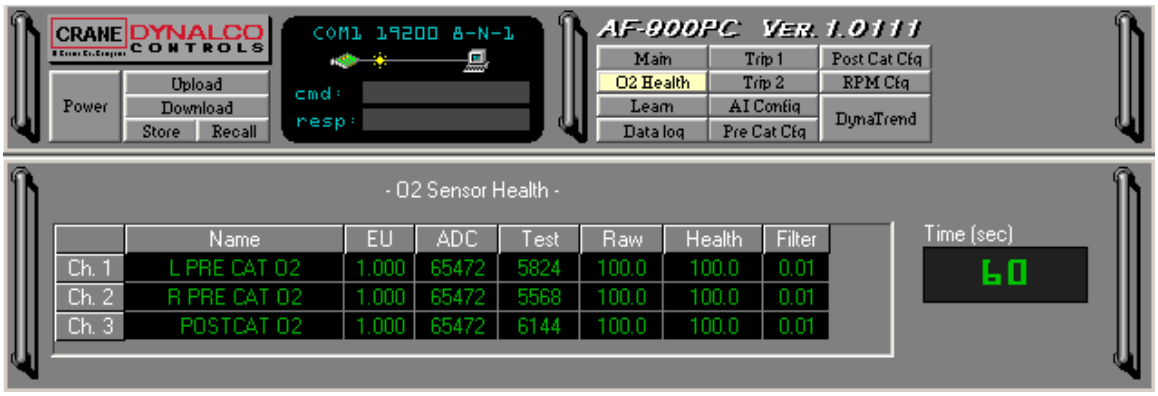
Main Screen
Figure 8

OXYGEN SENSOR HEALTH SCREEN

The O_2 Health Screen (Fig. 9) shows parameters related to sensor health measurement.

Descriptions of the parameters are as follows:

EU: Displays the current voltage input from each O_2 sensor.
ADC: Displays the A/D converter counts from the last sensor input measurement.
Test: Displays the A/D converter counts from the last sensor test measurement.
Raw: Displays the last calculated sensor health for each sensor.
Health: Displays the filtered sensor health for each sensor.
Filter: Programmable parameter sets the filter time constant for the sensor health. With the maximum value of 1.0, there is no filtering and each sensor test becomes the new Health value. With the default filter value of 0.01, each new sensor reading becomes 1/100th of the Health value. In other words, a smaller filter value means more filtering.
Time (sec): Determines time interval (in seconds) at which sensor health test will be performed. Sensor Health test is performed every 60 seconds with the default value of 60.



Oxygen Sensor Health Screen
Figure 9

LEARN SCREEN

The Learn Screen (Fig. 10) displays the post-catalyst offset and valve learn tables created during the MAP programming procedure. MAP pressure and post-catalyst setpoint values are also shown on this screen. MAP programming may only be initiated from the AF900PC front panel and will be discussed later in the manual. Each new point programmed will be entered into the proper place on the table according to the MAP pressure. The PC offset and valve pos % will change linearly between points on the table. A point may be deleted from the table by clicking into the *En* for that point, deleting the *En* with the backspace key, and entering *DIS*. The PC offset and valve pos % for any point may be changed by deleting the old value and entering a new value. The MAP values in the tables cannot be altered.

CRANE DYNALCO CONTROLS
Power
Upload
Download
Store
Recall
COM1 19200 8-N-1
cmd: 120
resp: 0
AF-900PC Ver. 1.0127
Main
Trip 1
Post Cat Cfg
O2 Health
Trip 2
RPM Cfg
Learn
AI Config
DynaTrend
Data log
Pre Cat Cfg
MAP # 1 (PSIG)
0.0
MAP # 2 (PSIG)
0.0
MAP Avg. (PSIG)
0.0
Post Cat Stp Req (V)
0.848
Post Cat Stp Offset (V)
0.000
Post Cat Stp Comp (V)
0.848
- Post Catalyst Offset -
En # Avg MAP PC Offset
Pt. 1 DIS 0 0.0 0.000
Pt. 2 DIS 0 0.0 0.000
Pt. 3 DIS 0 0.0 0.000
Pt. 4 DIS 0 0.0 0.000
Pt. 5 DIS 0 0.0 0.000
Pt. 6 DIS 0 0.0 0.000
Pt. 7 DIS 0 0.0 0.000
Pt. 8 DIS 0 0.0 0.000
Pt. 9 DIS 0 0.0 0.000
Pt.10 DIS 0 0.0 0.000
- Valve # 1 -
En # MAP Valve Pos %
Pt. 1 DIS 0 0.0 0.0
Pt. 2 DIS 0 0.0 0.0
Pt. 3 DIS 0 0.0 0.0
Pt. 4 DIS 0 0.0 0.0
Pt. 5 DIS 0 0.0 0.0
Pt. 6 DIS 0 0.0 0.0
Pt. 7 DIS 0 0.0 0.0
Pt. 8 DIS 0 0.0 0.0
Pt. 9 DIS 0 0.0 0.0
Pt.10 DIS 0 0.0 0.0
- Valve # 2 -
En # MAP Valve Pos %
Pt. 1 DIS 0 0.0 0.0
Pt. 2 DIS 0 0.0 0.0
Pt. 3 DIS 0 0.0 0.0
Pt. 4 DIS 0 0.0 0.0
Pt. 5 DIS 0 0.0 0.0
Pt. 6 DIS 0 0.0 0.0
Pt. 7 DIS 0 0.0 0.0
Pt. 8 DIS 0 0.0 0.0
Pt. 9 DIS 0 0.0 0.0
Pt.10 DIS 0 0.0 0.0

Learn Screen
Figure 10

DATA LOG SCREEN

This screen (Fig. 11) sets up the data log system and current date/time.

Data log parameters may be modified as follows:

Current Date/Time: The time and date may be changed by deleting the old value and entering a new value as required.
Data Log Schedule: Up to ten (10) daily data log times or a periodic data log interval may be used. The unit may also be set up for one (1) periodic interval time and up to nine (9) daily log times.

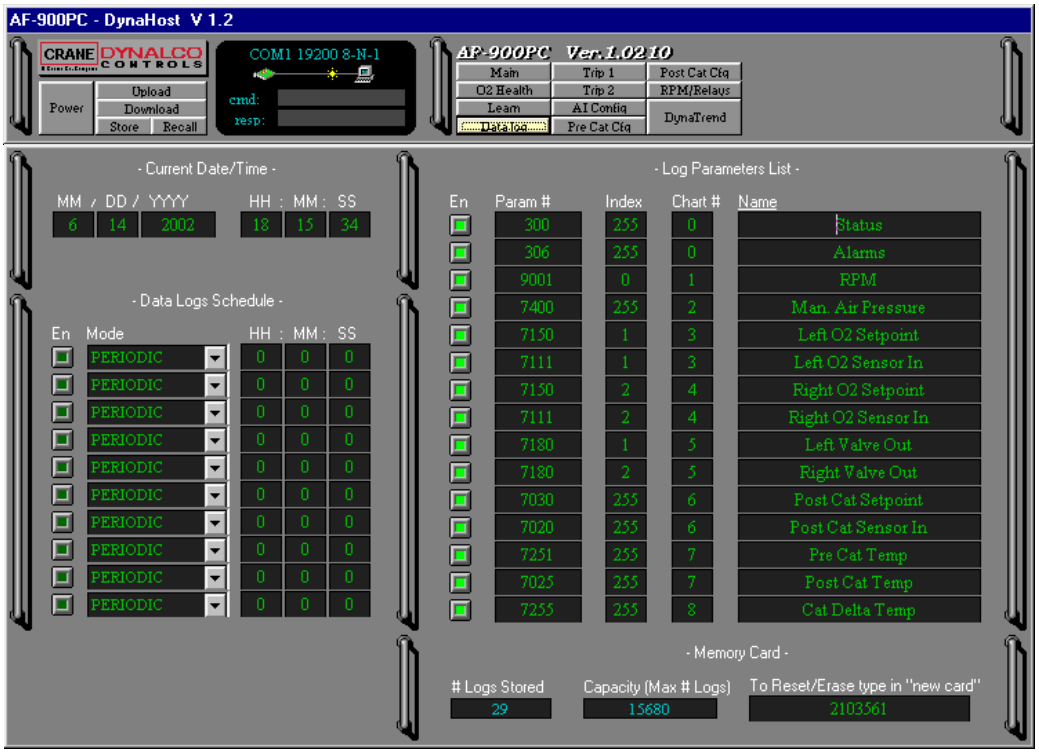
To enable periodic mode data logging:

1. Enter the desired data log interval.
2. Select **PERIODIC** mode from the drop down menu.
3. Click the *EN* button for that channel.

To enable daily data logging:

1. Enter the desired data log time.
2. Select **DAILY** mode from the drop down menu.
3. Click the *En* button on that channel.

NOTE: Data Log may occur as often as once per second.



Data Log Screen
Figure 11

Log Parameter List: The Log Parameter List (Fig. 11) shows the most important controller parameters being data logged. Disable by clicking the *En* buttons for any parameters you do not wish to data log. Enter “0” for the Chart # for any parameters where an excel chart is not required.

NOTE: Parameters having no numerical value (such as Status) must be assigned to chart # 0.

NAME shows the parameter name as it appears on the header on the excel spreadsheet and on the excel charts. The names may be edited if desired.

If you wish to log a parameter not shown:

1. Enter the parameter number and index.
2. Enter the parameter chart #.
3. Enter the parameter name.

The parameter number and index may be found by placing the cursor over the name of the parameter. The index is the decimal value of the parameter.

NOTE: Enter 255 for the index if the parameter does not have a decimal value.

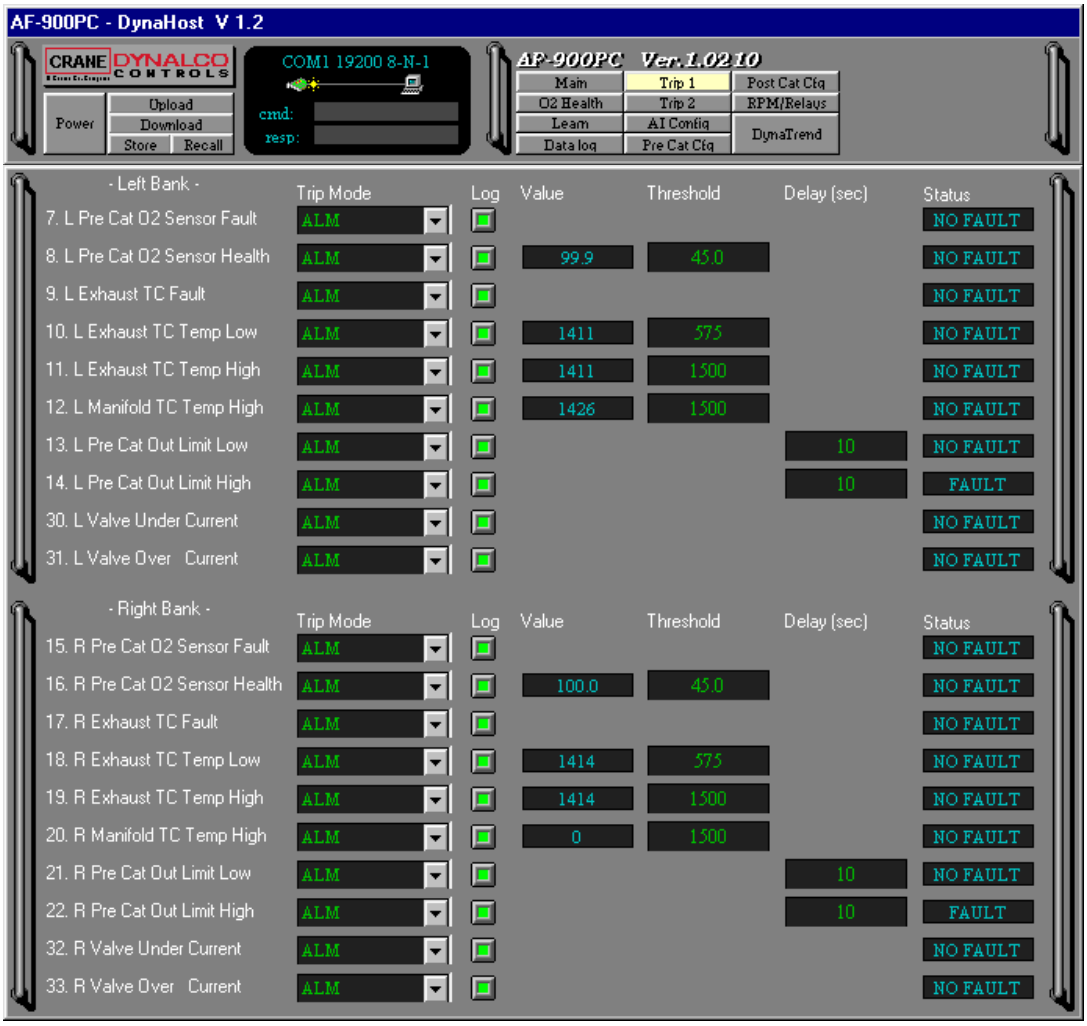
Flash Memory: This section, shown at the bottom of Fig. 11 of the data log screen, shows the status of the Onboard Flash Memory. “# Logs Stored” indicates the number of data logs which have occurred since the last memory reset. “Capacity” shows the maximum number of data logs required to fill the memory. To “reset” memory, type “new card” in the Reset box and press enter. The flash memory will be reset when the next data log occurs. All previously recorded data on the flash memory will be lost upon reset.

NOTE: The following descriptions apply to the Trip 1 and Trip 2 Screens

TRIP SCREEN 1

A screen (Fig. 12) used to setup the trip action for pre-catalyst system faults. The screen shows all faults set to **Alarm** and **Data Log**.

Trip Mode: Selects the action, from the drop down menu, which will be taken by the controller when the fault occurs. To make best use of the system diagnostics, it is recommended that all trips be programmed to **Alarm** or **Shutdown** so the operator will be alerted if a fault occurs. Faults that are critical to the engines health, such as high catalyst temperature, should be configured to **Shutdown** so the shutdown relay contacts may be used to trip the panel annunciator.
Disabled (DIS): The trip is disabled and no action will be taken.
Alarm (ALM): Trips the Alarm Relay, flashes the Alarm LED, and shows the fault on the LCD display.


AF-900PC - DynaHost V 1.2
CRANE DYNALCO CONTROLS
COM1 19200 8-N-1
cmd:
resp:
Power
Upload
Download
Store
Recall
AF-900PC Ver.1.02 10
Main
Trip 1
Post Cat Cfg
O2 Health
Trip 2
RPM/Relays
Learn
AI Config
DynaTrend
Data log
Pre Cat Cfg
- Left Bank -
Trip Mode
Log
Value
Threshold
Delay (sec)
Status
7. L Pre Cat O2 Sensor Fault ALM NO FAULT
8. L Pre Cat O2 Sensor Health ALM 99.9 45.0 NO FAULT
9. L Exhaust TC Fault ALM NO FAULT
10. L Exhaust TC Temp Low ALM 1411 575 NO FAULT
11. L Exhaust TC Temp High ALM 1411 1500 NO FAULT
12. L Manifold TC Temp High ALM 1426 1500 NO FAULT
13. L Pre Cat Out Limit Low ALM 10 NO FAULT
14. L Pre Cat Out Limit High ALM 10 FAULT
30. L Valve Under Current ALM NO FAULT
31. L Valve Over Current ALM NO FAULT
- Right Bank -
Trip Mode
Log
Value
Threshold
Delay (sec)
Status
15. R Pre Cat O2 Sensor Fault ALM NO FAULT
16. R Pre Cat O2 Sensor Health ALM 100.0 45.0 NO FAULT
17. R Exhaust TC Fault ALM NO FAULT
18. R Exhaust TC Temp Low ALM 1414 575 NO FAULT
19. R Exhaust TC Temp High ALM 1414 1500 NO FAULT
20. R Manifold TC Temp High ALM 0 1500 NO FAULT
21. R Pre Cat Out Limit Low ALM 10 NO FAULT
22. R Pre Cat Out Limit High ALM 10 FAULT
32. R Valve Under Current ALM NO FAULT
33. R Valve Over Current ALM NO FAULT

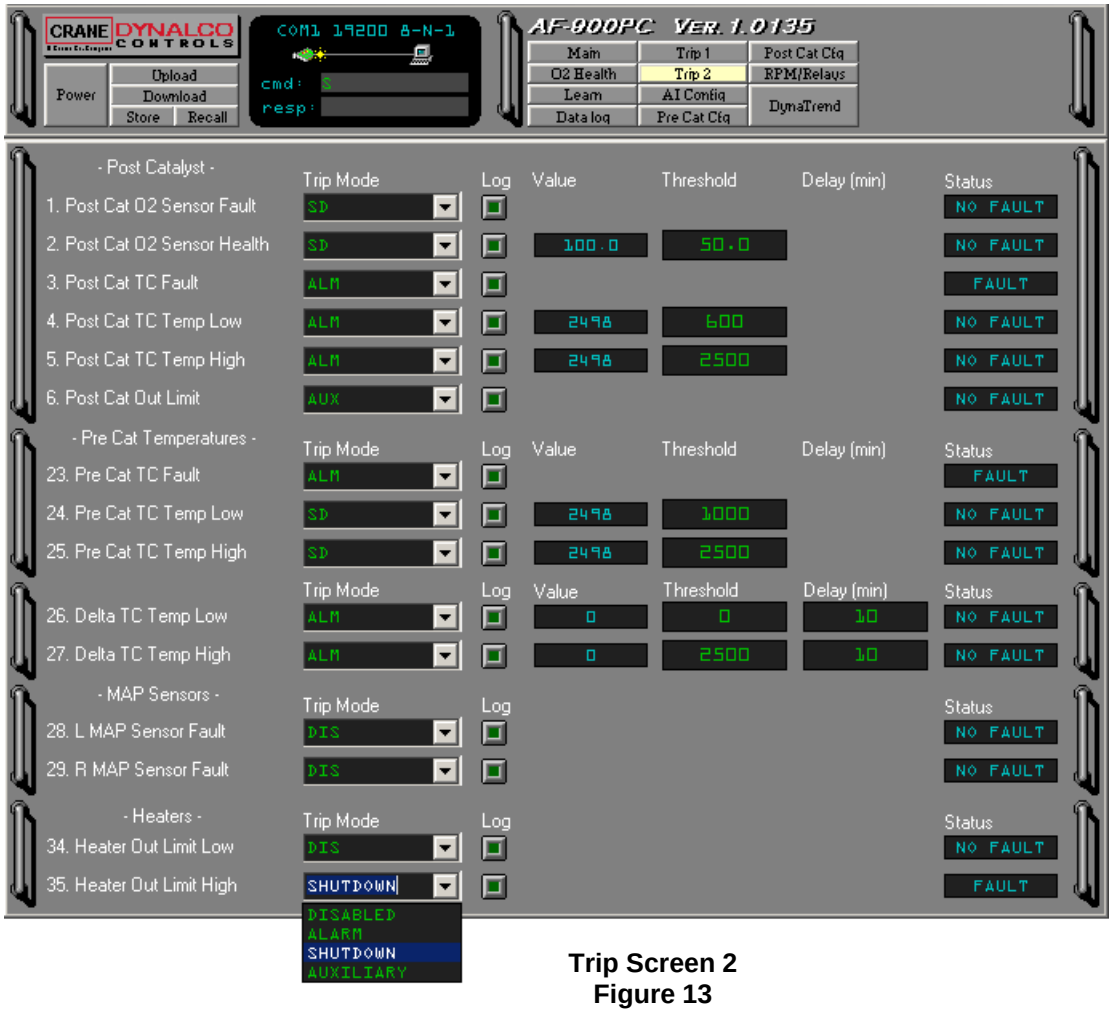
Trip Screen 1
Figure 12

Shutdown (SD): Trips the shutdown relay, flashes the shutdown LED, and shows the fault on the LCD display.
Auxiliary (AUX): Trips the auxiliary alarm when fault occurs.

Log: Click the **Log** button “ON” to force a data log to internal flash memory when the fault occurs.
Value: This column displays the current value of all trips that have a numeric value. The value displayed is after the appropriate filters have been applied.
Threshold: This column displays the trip threshold value for all trips that have a numeric value. To change a threshold value, click into the parameter and edit it.
Delay: This column indicates the delay time in seconds or minutes between the fault occurring and the trip being actuated. All delay times may be edited and have a range of 0 to 240.
Status: Indicates whether each trip is in the “Fault “ or “No Fault” condition.

TRIP SCREEN 2

This screen (Fig. 13) is used to setup the trip action for post-catalyst and catalytic converter system faults.

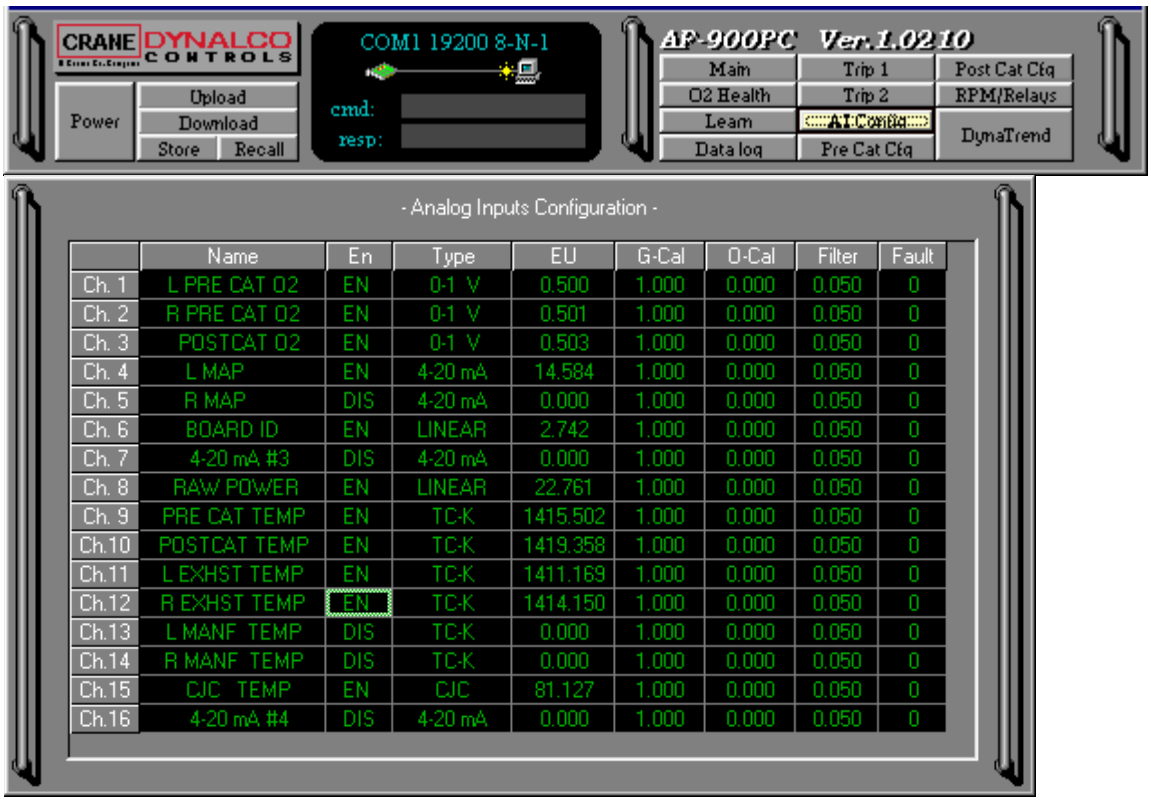


Trip Screen 2
Figure 13

ANALOG INPUTS CONFIGURATION SCREEN

This screen (Fig. 14) is used to set up the analog input system. It also shows the current status of every channel.

NOTE: Specialized personnel should use this screen primarily to enable and disable inputs for the application.



	Name	En	Type	EU	G-Cal	O-Cal	Filter	Fault
Ch. 1	L PRE CAT O2	EN	0-1 V	0.500	1.000	0.000	0.050	0
Ch. 2	R PRE CAT O2	EN	0-1 V	0.501	1.000	0.000	0.050	0
Ch. 3	POSTCAT O2	EN	0-1 V	0.503	1.000	0.000	0.050	0
Ch. 4	L MAP	EN	4-20 mA	14.584	1.000	0.000	0.050	0
Ch. 5	R MAP	DIS	4-20 mA	0.000	1.000	0.000	0.050	0
Ch. 6	BOARD ID	EN	LINEAR	2.742	1.000	0.000	0.050	0
Ch. 7	4-20 mA #3	DIS	4-20 mA	0.000	1.000	0.000	0.050	0
Ch. 8	RAW POWER	EN	LINEAR	22.761	1.000	0.000	0.050	0
Ch. 9	PRE CAT TEMP	EN	TC-K	1415.502	1.000	0.000	0.050	0
Ch.10	POSTCAT TEMP	EN	TC-K	1419.358	1.000	0.000	0.050	0
Ch.11	L EXHST TEMP	EN	TC-K	1411.169	1.000	0.000	0.050	0
Ch.12	R EXHST TEMP	EN	TC-K	1414.150	1.000	0.000	0.050	0
Ch.13	L MANF TEMP	DIS	TC-K	0.000	1.000	0.000	0.050	0
Ch.14	R MANF TEMP	DIS	TC-K	0.000	1.000	0.000	0.050	0
Ch.15	CJC TEMP	EN	CJC	81.127	1.000	0.000	0.050	0
Ch.16	4-20 mA #4	DIS	4-20 mA	0.000	1.000	0.000	0.050	0

Analog Inputs Configuration Screen
Figure 14

Name: Name of each analog input channel. Channel names cannot be changed.
Type: Shows input type for each analog input channel. Type cannot be changed.
EU: Displays current measurement value for each analog input channel.
G-Cal: Factory gain calibration setting that should not be changed.
O-Cal: Factory offset calibration setting that should not be used.
Filter: Filter value applied to each input channel. The minimum value of 0.001 provides maximum filtering while the maximum value of 1.000 provides no filtering.
Fault: This column indicates each input channel's fault status. All channels should show "0" if there are no faults. Inputs faults are latching and must be cleared by pressing the **Reset** button on the front panel.
En: This column is used to enable the required input channels. Entering **EN** enables the channel, while entering **DIS** disables the channel. Enable the input channels listed below:

Single or Dual Bank

L PRE-CAT O_2
POST-CAT O_2
BOARD ID
RAW POWER
PRE-CAT TEMP
POST-CAT TEMP
L EXHST TEMP
CJC TEMP

Dual Bank Only

R PRE-CAT O_2
R EXHST TEMP

For MAP Programming

L MAP
R MAP (Optional)

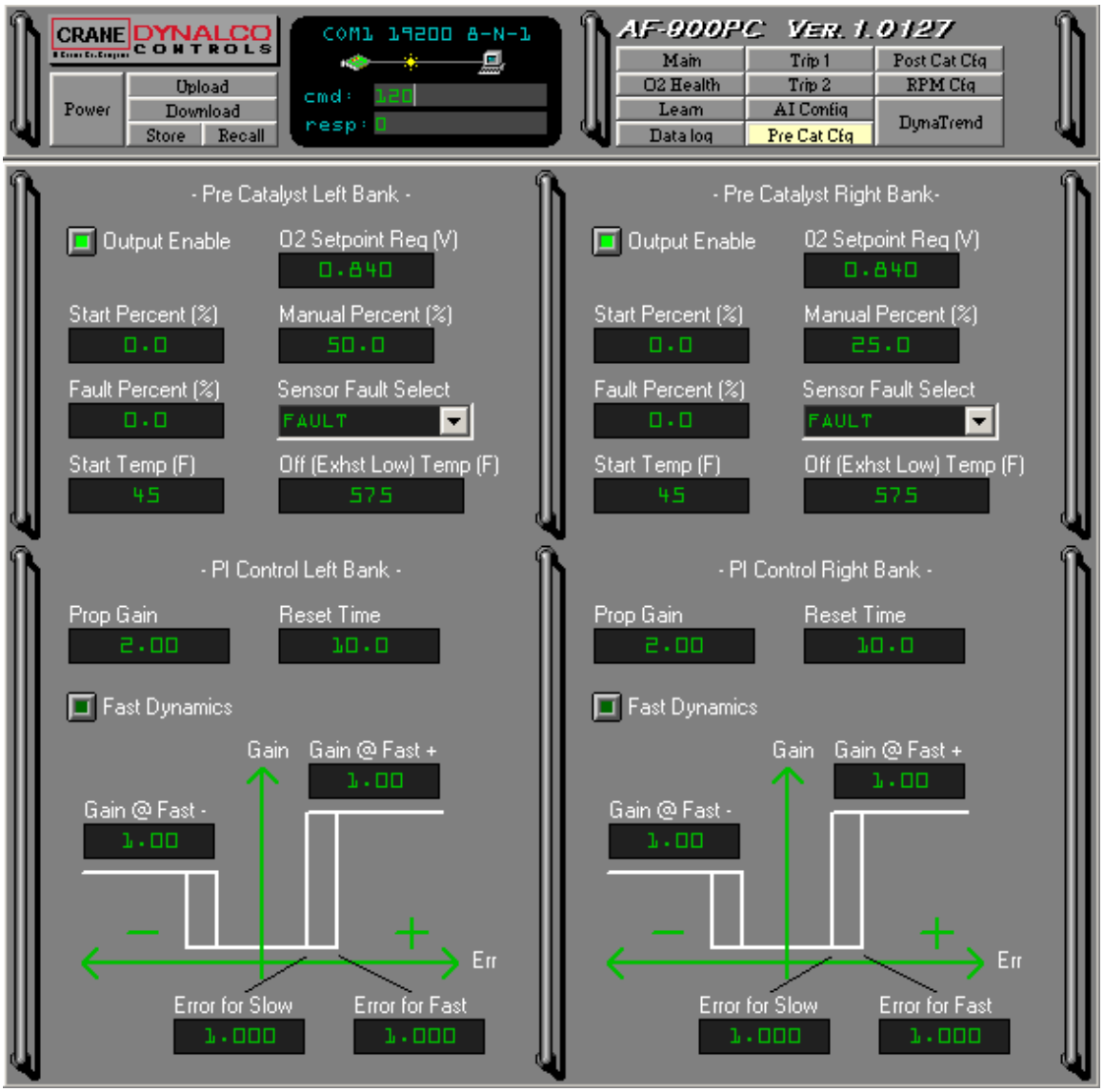
For Intake Manifold Temperature

L MANF TEMP
R MANF TEMP

NOTE: 4/20 #3 and 4/20 #4 are not used by the AF900PC.

PRE-CATALYST CONFIGURATION SCREEN

This screen (Fig. 15) is used to set up the left and right bank pre-catalyst system. The following section describes the function of every parameters located on this screen. The parameters for the left and right bank are identical so they will be discussed only once.



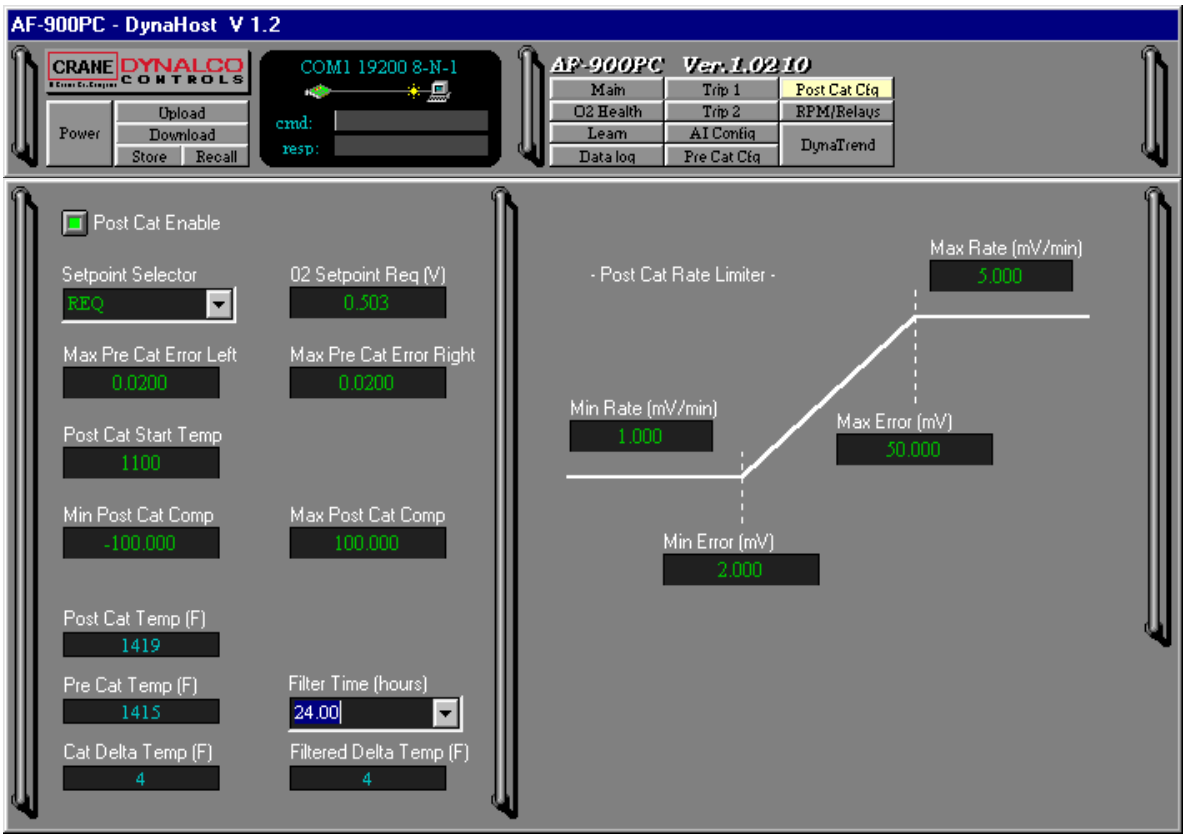
Pre-Catalyst Configuration Screen
Figure 15

Output Enable: This button enables or disables the left or right bank PI control loop. One bank must be enabled for the controller to function.
O_2 Setpoint Req (V): Sets the initial target voltage for the left and right bank Pre-Cat O_2 sensors. Typically set between 0.700 and 0.900 Volts.
Start Percent (%): Sets the fuel valve opening when the controller is in the **START** mode.
Manual Percent (%): Sets the fuel valve opening when the controller is in the **MANUAL** mode.
Fault Percent (%): Sets the fuel valve opening when a pre-cat O_2 sensor fault occurs if the sensor fault select is set to **FAULT**.

Sensor Fault Select: Determines what control action will be taken if the pre-cat O_2 sensor has a fault. Options are chosen from a drop down menu and are as follows:
Opposite: Sets the fuel valve opening the same as the opposite bank.
Fault: Sets the fuel valve opening to the value configured in the "fault percent (%)" parameter.
MAP: Sets the fuel valve opening from the learn table based on current manifold air pressure reading.
Start Temp (F): Controller changes from **SENSOR WARM UP** mode to **AUTO** mode when exhaust temperature exceeds this threshold.
Off (Exhst Low) Temp (F): Controller returns to **SENSOR WARM UP** mode when the exhaust temperature on either bank drops below this threshold. This parameter is also used for "Exhaust TC Temp Low" trip.
Prop Gain: The pre-catalyst proportional gain parameter determines the gain of the PI control loop. The larger the gain, the more aggressive the output changes in response to errors. A typical of 0.020 is a good place to start.
Reset Time: The pre-catalyst reset time parameter determines the integration rate of the PI control loop. The smaller the reset time parameter the faster the control loop will integrate and increase or decrease the output while there is error. A typical value of 5.0 is a good starting point.
Fast Dynamics: This button enables or disables the fast dynamic control function. Fast dynamics are used to boost the proportional gain when a large error occurs.
Gain @ Fast +: Sets the proportional gain multiplier when in fast dynamics with a Pre-Cat O_2 sensor reading greater than the "O_2 Setpoint Comp (V)". A starting value of 3.0 is suggested.
Gain @ Fast -: Sets the proportional gain multiplier when in fast dynamics with a Pre-Cat O_2 sensor reading less than the "O_2 Setpoint Comp (V)". A starting value of 3.0 is suggested.
Error for Slow: Sets the error voltage at which the PI loop will return to slow dynamics. A starting value of 0.025 is suggested.
Error for Fast: Sets the error voltage at which the PI loop will go into fast dynamics. A starting value of 0.050 is suggested.

POST-CATALYST CONFIGURATION SCREEN

This screen (Fig. 16) sets up the post-catalyst system. All parameters that are green may be changed.



Post-Catalyst Configuration Screen
Figure 16

Post-Cat Enable: This button allows the post-catalyst control to be enabled and disabled.

Setpoint Selector: Selects the source for the final post-cat sensor target voltage. When set to **REQ**, the final target voltage will be the O_2 Setpoint Req (V) voltage. When set to **MAP**, the final target voltage becomes the O_2 Setpoint Req (V) modified by the MAP table.

O_2 Setpoint Req (V): Sets the initial target voltage for the post-cat O_2 sensor. Typical range for this parameter is 0.650 to 0.850 V.

Max Pre-Cat Error Left: Sets the maximum allowable left bank pre-cat error for the post-cat control to be active. Post-cat integration is frozen when the error exceeds this value. Typically set to 0.020

Max Pre-Cat Error Right: Sets the maximum allowable right bank pre-cat error for the post-cat control to be active. Post-cat integration is frozen when the error exceeds this value. Typically set to 0.020.

Post-Cat Start Temp: Sets the minimum catalytic converter outlet temperature to enable post-catalyst control. This temperature should be set high enough to allow proper catalytic converter action before post-catalyst control is attempted.

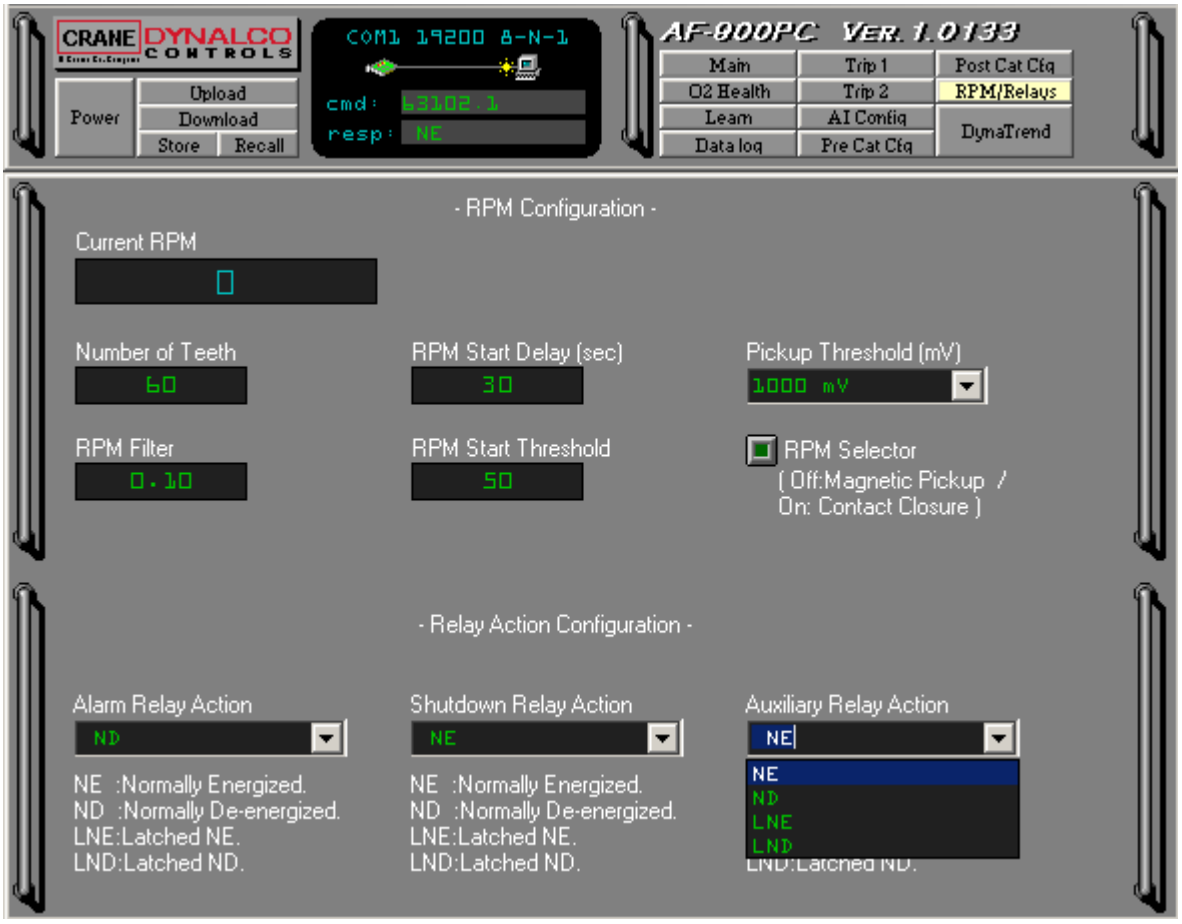
Min Post-Cat Comp: Sets the maximum allowable negative post-cat compensation in millivolts. Post-cat integration will be frozen when this level is reached. Typically set to –100.
Max Post-Cat Comp: Sets the maximum allowable positive Post-cat compensation in millivolts. Post-cat integration will be frozen when this level is reached. Typically set to 100.
Post-Cat Temp (F): Displays the current post-catalyst temperature value.
Pre-Cat Temp (F): Displays the current pre-catalyst temperature value.
Cat Delta Temp (F): Displays the current temperature differential across the catalytic converter.
Filtered Delta Temp (F): Displays the temperature differential across the catalytic converter after the time filter has been applied.
Filter Time (hours): Select the desired filter time for the **FILTERED DELTA TEMP** from the drop down menu. Filter time is defined as the time required to reach 100% of the new value when a change in delta temperature occurs. The filter is not linear. Listed below is an example of the % new value reached at different points of the filter time:

1/8 time	~	37%	1/4 time	~	60%
1/2 time	~	85%	1 time	~	100%

The following 4 parameters work together to establish the post-catalyst control integration rate for pre-cat setpoint compensation when an error exists. The association between these parameters is shown in the drawing on the configuration screen on the following page.
Min Error (mV): Sets the minimum post-cat error voltage. No post-cat control will occur when the error is less than this value. Set to 2.000 as a starting point.
Max Error (mV): Sets the post-catalyst error voltage for max rate post-cat integration will begin. Set to 50.000 as a starting point.
Min Rate (mV/min): Sets the minimum post-cat integration control rate. Set to 1.000 as a starting point.
Max Rate (mV/min): Sets the maximum post-cat integration control rate. Set to 5.000 as a starting point.

RPM/RELAY CONFIGURATION SCREEN

This screen (Fig. 17) sets up the RPM channel and the action of the relays.



RPM/Relays Configuration Screen
Figure 17

RPM Configuration:

Current RPM: Displays the current running speed of the engine.
Number of Teeth: Enter the number of teeth on the flywheel when using a magnetic pickup for speed input indication.
RPM Filter: Sets the amount of filtering for the RPM display. With a minimum setting of 0.01, the RPM display will be averaged over 100 readings. There is no filtering with a maximum setting of 1.00. Typically set at 0.1.
RPM Start Delay (sec): Sets the time interval for the controller and will remain in the **START** mode when the engine is started. When in **START** mode, the fuel valves are forced to **START %** allowing the engine to stabilize before attempting automatic control. The minimum time is 0, maximum time is 300 seconds.
RPM Start Threshold: Sets the minimum engine speed on start for the engine to be considered running. Minimum setting is 30 RPM. This parameter is used only when using a magnetic pickup for speed sensing.

Pickup Threshold (mV): Selects the speed input voltage sensitivity from the drop down menu. A setting of 1000 mV will work for most applications. At this setting a minimum pickup input voltage of 1.000 peak (0.707 VAC RMS) is required. Used only when magnetic pickup is used for speed input.
RPM Selector: Selects which speed input source will be used to determine that the engine is running. When clicked **ON**, the speed contact closure will be used to signal a run condition.

NOTE: Engine RPM cannot be displayed when using the contact closure speed input.

When clicked **OFF** the magnetic pickup speed input will be used to determine engine speed.

Relay Action Configuration:

The three drop down menus in this section determine the control action for the Alarm, Shutdown, and Auxiliary Relays. Select the desired control action for each relay from the description below:
NE: The relay is normally energized and will de-energize while in the tripped state.
ND: The relay is normally de-energized and will energize while in the tripped state.
LNE: The relay is normally energized and will latch in the de-energized state when a trip occurs. The latched relay trip condition may be cleared by pushing the front panel **RESET** key.
LND: The relay is normally de-energized and will latch in the energized state when a trip occurs. The latched relay trip condition may be cleared by pushing the front panel **RESET** key.

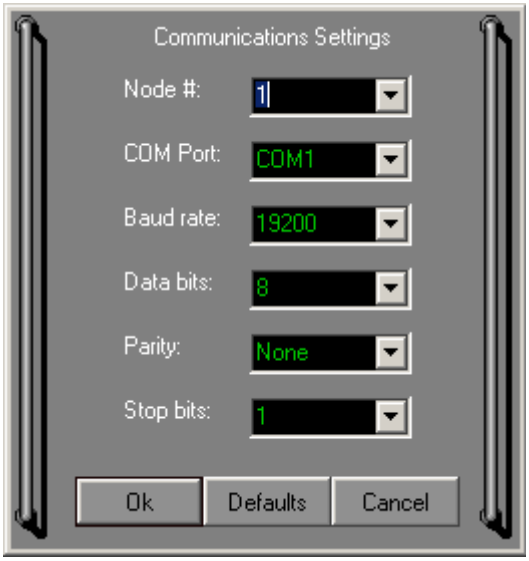
10.4 Communication Settings Dialog

This dialog (Fig. 18) is displayed when you click on the communication settings label in the control panel.

The AF900PC is configured by default with the settings shown in Figure 18. The settings can be recalled at any time by pressing the *Defaults* button.

Use this screen to change the COM port number to match the serial port being used by your computer.

NOTE: All other parameters are fixed by the AF900PC firmware and changing them will cause a communication failure.



Communication Settings
Figure 18

11. Computer Interface Using Configuration File

Another method used to configure the AF900PC is to edit and download a configuration file to the AF900PC. The configuration file is a template file that contains all configurable parameters and an explanation for all parameter configuration settings. The user must enter desired configuration values for all appropriate configuration parameters before downloading the file to the AF900PC.

The configuration file can be edited with any text editor or word processor that can save files in text format, such as Wordpad available on Windows PCs.

The download file contains configuration comments and parameter configurations. The comments for the configuration parameters explain the function for each parameter and the programmable values associated for each parameter. The comments are any text or text characters that follow a semicolon.

General AF900PC configuration comments should not be deleted. However, some comments, such as '<ANALOG INPUT CHANNEL #01>', have been included for the user to overwrite with application-specific descriptors, such as 'Engine Exhaust Temperature'. Once the file has been edited, it should be saved under a different name so that the original factory .spc file remains intact.

The configuration file's parameter configurations program the corresponding AF900PC parameters when the file is downloaded to the AF900PC.

11.1 Downloading a Configuration File

A list of parameters along with their values can be downloaded to the AF900PC. The configuration file has a .spc file extension and is a plain ASCII text file.

NOTE: An example of a configuration file is shown in Appendix A.

A semicolon character indicates the start of a comment. A comment can start anywhere on a line. The end of line terminates the comment.

Parameters and their values are specified using the following format:

param_number = value ; comment

The parameter is specified by the ‘param_number’ argument, followed by an equal sign and then the actual desired parameter value in the ‘value’ argument. An optional comment can be added to describe what the parameter number represents. The last line of the configuration file should contain a single ‘S’ character that must be sent to the controller. This command tells the controller to store the parameters just downloaded.

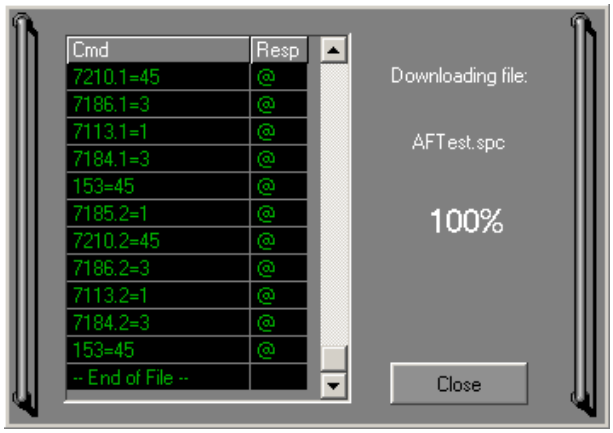
CAUTION: DynaHost sends only the commands found in the configuration file. If the ‘S’ is not present in the file, it will not be sent to the controller.

```
;*************************************************************
*****************
                              DYNALCO CONTROLS
;                           3690  N.W. 53rd Street
;                         Fort Lauderdale,  FL 33309
;
;                                  AF900PC
;
; Filename : AF900PC.SU
; Date     : March 16, 2002
;*************************************************************
*****************
;
  1=50          ; Set the number of teeth
  2=16          ; Set the number of cylinders
  3=4           ; Set the number of strokes
  4=100
  6=0
```

```
  8=1
  9=2000
 11=9
 12=0
 77=33.5
 86=0
105=0
106=3500
107=0
110=30
111=350
112=30
S            ; Store parameter to non-volatile memory
```

A configuration file (AF900PC.spc) is provided with the DynaHost program. Use this file to edit or when you want to go back to the factory defaults.

A report is presented (Fig. 19) when downloading the configuration file. A successful response to a command sent is represented with an ampersand '@'.



Download Report
Figure 19

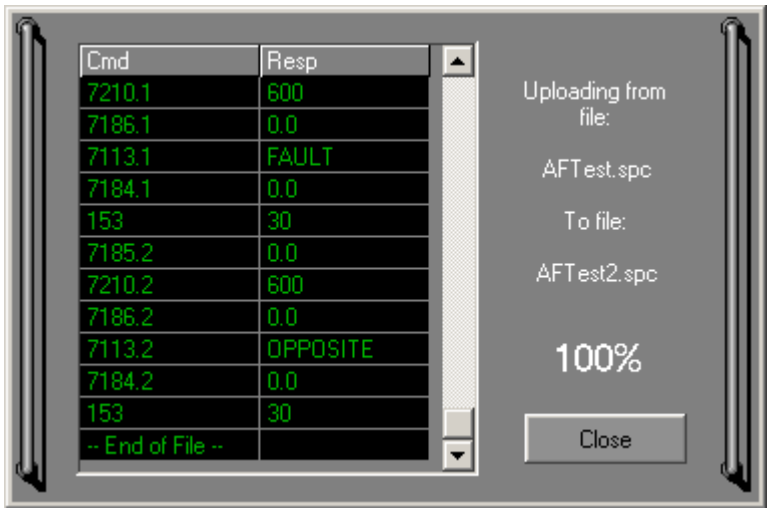
11.2 Uploading Configuration to an .spc file

It is recommended that a configuration file (.spc) with the current configuration of your system be saved once the controller has been optimized for the installation. This will provide a download file for other controllers used on similar engine types.

To upload a file, click the *Upload* button on the control panel of any DynaHost screen. You will be presented with two dialog boxes; the first one is going to ask for the 'Source File', which could be the AF900PC.spc file provided from factory. The second dialog box is going to ask for the 'Target File' where you are going to save

the configuration. A file name such as the engine name may be used for the target, but the name must end in ".spc".

An upload report (Fig. 20) will open showing each parameter and it's corresponding value once data transfer begins.



Upload Report
Figure 20

12. Software Operation

12.1 AUTO Mode

After power-up, the AF900PC will begin operation in **STOPPED** mode since most likely the RPM input will be zero. In this state, the controller completely closes both the left and right bank fuel valves.

Once the AF900PC measures sufficient engine RPM (RPM>Startup RPM parameter) or it detects the speed contact closure input present, it positions the left and right bank fuel valves to their startup positions. This is now the **START** mode.

In the **START** mode the AF900PC waits for a timer to expire before changing into the **SENS WARMUP** mode. Once in the **SENS WARMUP** mode the AF900PC waits for the O_2 sensors to warm up with the engine exhaust. During **SENS WARMUP** mode the valves are held in the startup position until the left and right bank exhaust temperatures are both above the threshold for the controller to go into **AUTO** mode.

NOTE: If using heated O2 sensors, the threshold will be set to 0 Deg F, enabling "AUTO" mode immediately following timer duration.

The delay timer in the **START** mode is setup in case a running engine shuts down, then quickly re-starts while the exhaust is still hot. In this case, the delay timer will allow conditions to stabilize before the controller further opens the fuel valves in **AUTO** mode.

Once in **AUTO** mode, the controller waits for both pre-catalyst control loops to stabilize and the pre-catalyst O_2 setpoints to be within a small error before introducing post-catalyst compensation. At that point the controller will be in its final mode, **AUTO/POST** which is automatic with post-catalyst compensation.

12.2 MANUAL Mode

In **MANUAL** mode, the controller operates entirely in accordance with manually entered parameter numbers, via DynaHost by the user. **MANUAL** mode may be entered and exited only from DynaHost.

In **MANUAL** mode, the PWM output is determined strictly by the Manual Percent (%) parameter(s). No automatic control takes place.

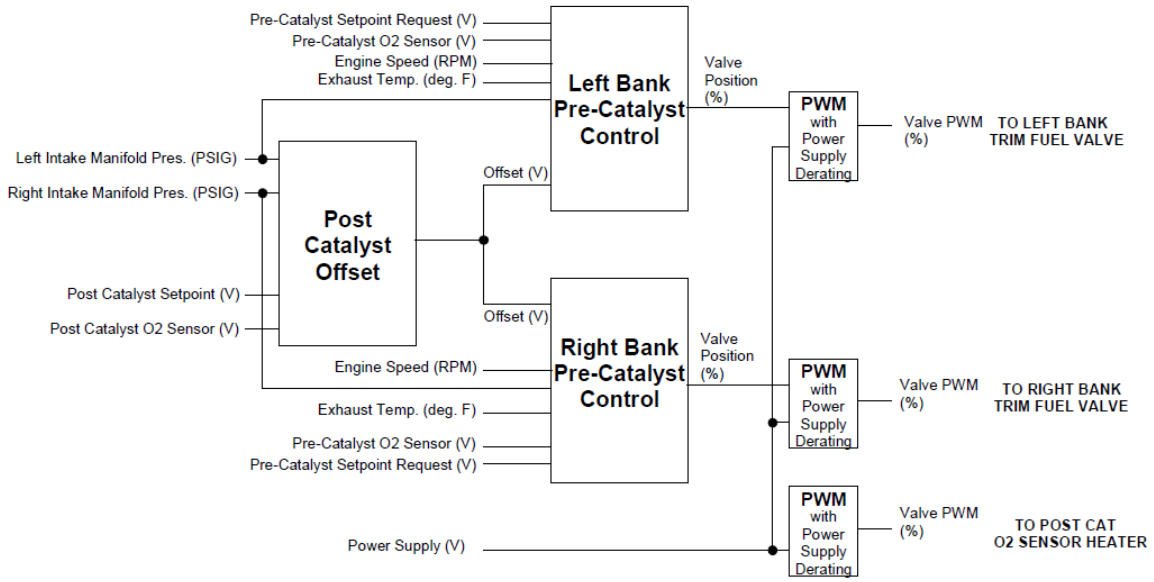
Note: It is recommended this mode only be used for troubleshooting by an experienced user.

13. Control Software

The AF-900PC control software consists of two independent, identical left and right bank pre-catalyst PI control loops. In addition, a separate post-catalyst offset control section adjusts both the pre-catalyst loop setpoints in order to compensate for actual catalytic converter behavior.

During initial system setup, the post-catalyst offset compensation is turned **OFF** and the two pre-catalyst setpoints are adjusted until a separate emissions analyzer shows that exhaust emissions are in compliance. At that point the post-catalyst O_2 sensor voltage is noted and used as the post- catalyst O_2 setpoint. This way the behavior of the catalytic converter is "captured" in the post-catalyst O_2 setpoint. Then the post-catalyst offset compensation is turned **ON**.

During normal operation, both the pre-catalyst loops will react faster to engine changes and the slower post -catalyst offset loop will adjust the two pre-catalyst loops based on factors which affect just the catalytic converter performance such as fuel BTU content, temperature, load, etc...


Pre-Catalyst Setpoint Request (V)
Pre-Catalyst O2 Sensor (V)
Engine Speed (RPM)
Exhaust Temp. (deg. F)
Left Bank Pre-Catalyst Control
Valve Position (%)
PWM with Power Supply Derating
Valve PWM (%)
TO LEFT BANK TRIM FUEL VALVE
Left Intake Manifold Pres. (PSIG)
Right Intake Manifold Pres. (PSIG)
Post Catalyst Offset
Offset (V)
Post Catalyst Setpoint (V)
Post Catalyst O2 Sensor (V)
Offset (V)
Right Bank Pre-Catalyst Control
Valve Position (%)
Engine Speed (RPM)
Exhaust Temp. (deg. F)
Pre-Catalyst O2 Sensor (V)
Pre-Catalyst Setpoint Request (V)
PWM with Power Supply Derating
Valve PWM (%)
TO RIGHT BANK TRIM FUEL VALVE
PWM with Power Supply Derating
Valve PWM (%)
TO POST CAT O2 SENSOR HEATER
Power Supply (V)

AF900PC

Simplified Control Software Block Diagram

14. Manifold Air Pressure Sensor (MAP) Load Compensation (Option)

The AF-900PC is capable of accepting an input from a MAP sensor in order to determine engine load. This option is needed for engines that operate over a very wide load range and thus, one fixed post-catalyst setpoint does not maintain emissions over the entire load range. If this option is used, the post-catalyst O_2 setpoint is "offset" according to the engine load, which is proportional to the MAP sensor output.

Up to ten offset points can be created for precise compensation in the high load range. In the low load range, the base post-catalyst O_2 setpoint is used exclusive of any offset. Only loads above "point zero" engine load (MAP) have any offset added to the base post-catalyst O_2 setpoint. At all engine loads the base post-catalyst O_2 setpoint never changes, but offsets are added to it once high engine load compensation begins.

In order to add MAP offsets, the user must enter **SETUP** mode by pressing the **SETUP** key. When prompted for a Password, enter "1 2 3 4 " (or the correct password if it has been changed from the factory default), and press **ENTER**.

A "Zero Point" must first be entered. Point zero is the starting point for MAP offset compensation to begin. The "Zero Point" is the largest MAP load where the engine remains in compliance with zero post-cat offset. To program "Zero Point" proceed as follows:

1. From the Setpoint menu, press the **MAP** *Soft Key*.

2. From the Map Programming menu screen, press the **MAP** *Soft Key*.

3. Once in the Map Programming screen, observe that the Offset is 0.000. If the Offset is zero, proceed to step 5.

4. Press the **Enter** button and note the "Off" value is bracketed. Press **Enter** again and note that "Off" is flashing. Use the **Up** and **Down** keys to set the value to zero, then press **Enter** again.

5. To program the "Zero Point", press the **MAP** *Soft Key*, then the **OK** *Soft Key*. The zero point is now programmed and will appear as Pt 1 in the post-catalyst offset table in the DynaHost learn screen. Also note that Pt 1 was also entered in the Valve #1 and Valve #2 learn tables.

The next step is to enter the full load MAP offset. Run the engine at 100% load for a minimum of 15 minutes before entering the full load offset.

Proceed to enter the full load offset as follows:

1. Press the **Enter** button twice and note that the "Off" value is flashing.

2. Use the **Up** and **Down** keys to add or subtract post-cat offset. This offset is immediately added to the Post-Cat Setpoint Req. When adjusting offset, allow ample time for the AF-900 and catalytic converter to react to the changes. Remember, the post-catalyst control loop is very slow.

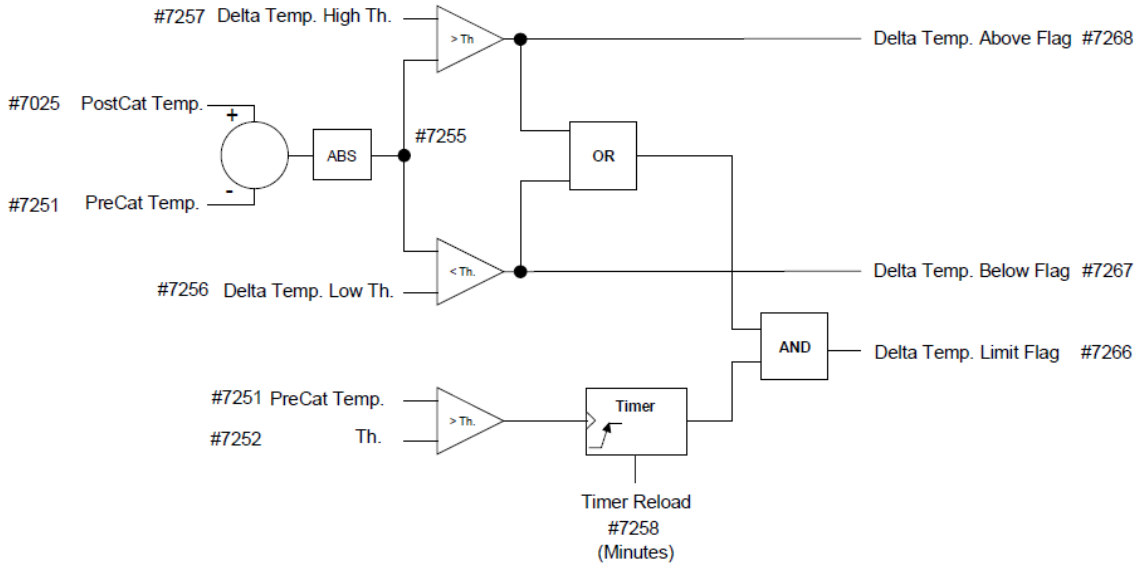
3. Once full load emissions compliance has been satisfied, press the **Enter** key to except the offset value followed by the **Escape** key. Next press the **OK** *Soft Key*. The full load offset value has now been saved and may be viewed as Pt 2 on the post-catalyst offset table on the DynaHost learn screen. Also note that Pt 2 has also been entered in the Valve #1 and Valve #2 learn tables.

Additional points may be entered, one at a time, if the engine does not meet emissions compliance at loads between the zero point and full load. Each point will then have an offset amount and a corresponding MAP load amount stored in non-volatile memory.

Using DynaHost, the offsets at these points may be altered, but not the corresponding MAP load amount at this point. The point must be deleted entirely in order to alter the MAP load amount, in which case an entirely new point may be added. No matter how many points are created, the points are connected in a linear manner to provide a continuous offset amount.

15. Catalytic Converter Delta Temperature

The logic diagram below shows the operation of the catalytic converter differential temperature measurement function. The pre-cat temperature is subtracted from the post-cat temperature to obtain delta temperature. The "Filter Time" set on the Post-Cat Cfg screen is then applied to the delta temperature used for the trips. A trip will occur if either the Delta Temp High or Delta Temp Low thresholds are exceeded, provided the start timer shown at the bottom of the diagram has expired.



AF900PC

Catalytic Delta Temperature

16. Data Logging

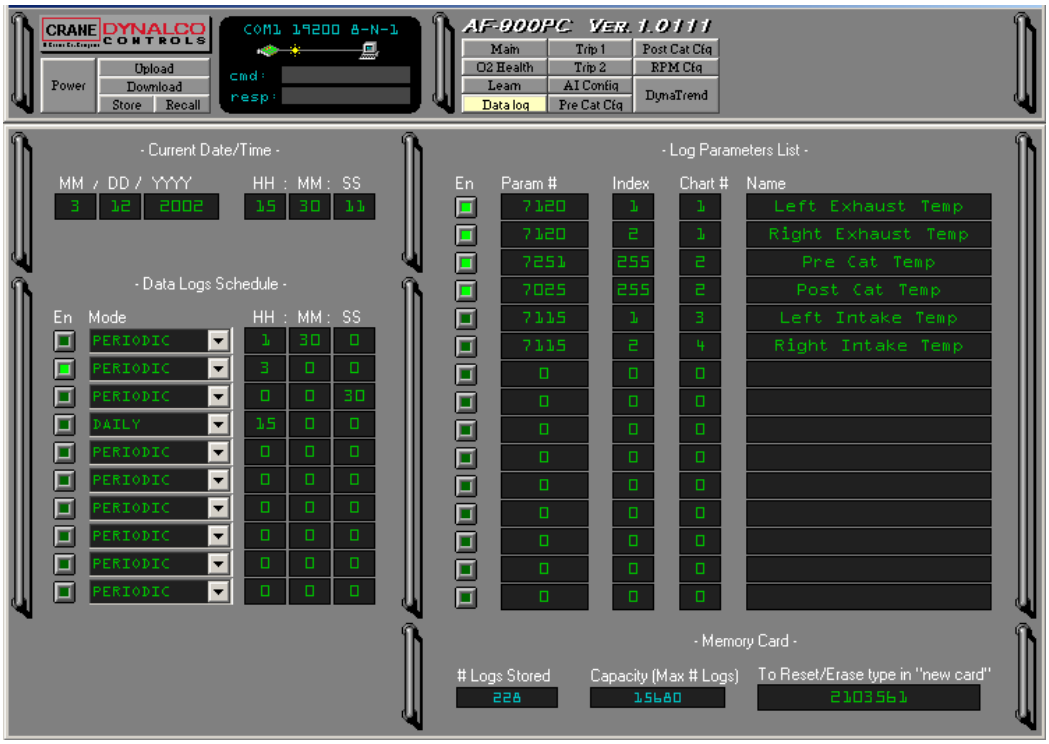
The AF900PC has powerful data logging capabilities through the use of on-board Flash Memory, providing up to 64 Megabytes of capacity.

Up to 15 parameters can be logged as fast as every 1 second. Additionally, **ALARMS** can be chosen for data logging as well as the AF900PC status (**MANUAL, START, AUTO, AUTO**).

Using Dynalco's Windows-based DynaTrend software, the user can transfer the logged data to a laptop and view or graph the data. Dynalco's DynaTrend software can automatically and seamlessly open Excel to view and graph the data. Each parameter logged is identified with a label and also a time/date stamp. Once the data has been transferred to a laptop using DynaTrend, the file can be saved and assigned a file name that can be the engine name/number/date, etc. with Windows standard long filenames.

17. Setup

Using DynaHost and the data logging screen file (Fig. 21), the user can decide which parameters are to be logged and how often or at what time of day. The set up of this screen has been described in Section 10 of the manual.



Data Log Screen
Figure 21

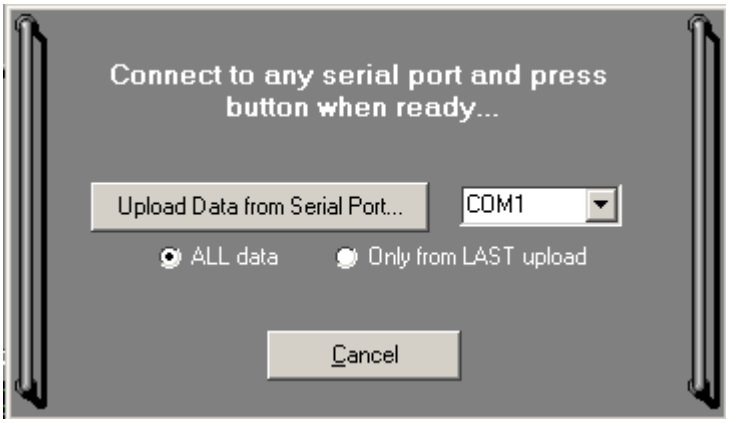
18. Transfer

To transfer the data to a laptop, connect the RS232 DB9 connector to the AF900PC and start the DynaHost software.

DynaTrend is the tool used to upload the data log information stored in memory. The information is uploaded into a text file in the comma-separated values format (.csv). DynaTrend also allows you to export the .csv file to Microsoft Excel.

DynaTrend software is initiated by clicking on the DynaTrend button at the top of any screen. The steps to follow, which are shown in Figures 22 & 23, appear on the computer screen. Once complete, the user is prompted to go to Excel for presentation of the data.

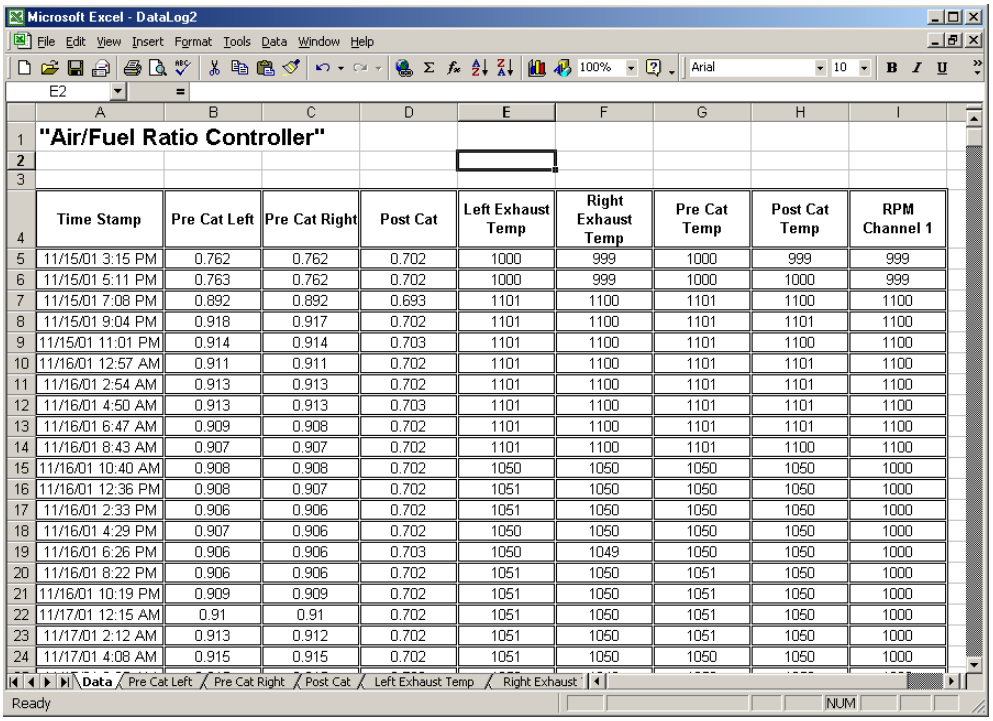
All the information stored in the memory may be uploaded, or only the information stored since the last time you uploaded.



DynaTrend (uploading data)
Figure 22

DynaTrend (exporting data to Excel)
Figure 23

The figures below shows an example of what the data log table and chart look like after exporting to Microsoft Excel:



Microsoft Excel - DataLog2

File Edit View Insert Format Tools Data Window Help

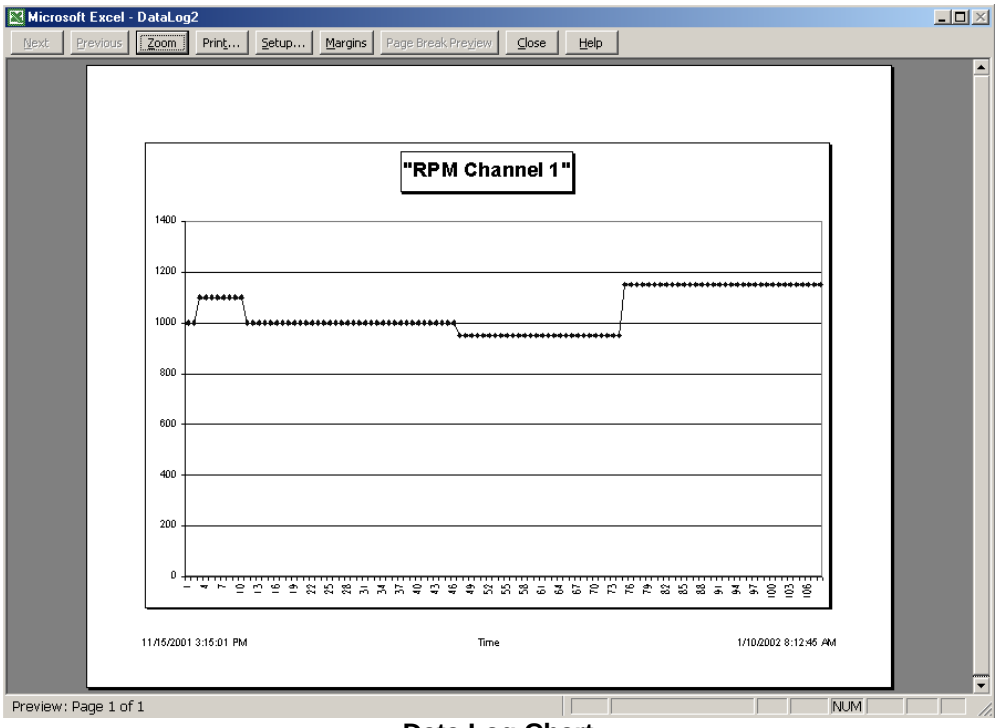
E2

	A	B	C	D	E	F	G	H	I
1	"Air/Fuel Ratio Controller"								
2									
3									
4	Time Stamp	Pre Cat Left	Pre Cat Right	Post Cat	Left Exhaust Temp	Right Exhaust Temp	Pre Cat Temp	Post Cat Temp	RPM Channel 1
5	11/15/01 3:15 PM	0.762	0.762	0.702	1000	999	1000	999	999
6	11/15/01 5:11 PM	0.763	0.762	0.702	1000	999	1000	1000	999
7	11/15/01 7:08 PM	0.892	0.892	0.693	1101	1100	1101	1100	1100
8	11/15/01 9:04 PM	0.918	0.917	0.702	1101	1100	1101	1101	1100
9	11/15/01 11:01 PM	0.914	0.914	0.703	1101	1100	1101	1100	1100
10	11/16/01 12:57 AM	0.911	0.911	0.702	1101	1100	1101	1101	1100
11	11/16/01 2:54 AM	0.913	0.913	0.702	1101	1100	1101	1101	1100
12	11/16/01 4:50 AM	0.913	0.913	0.703	1101	1100	1101	1101	1100
13	11/16/01 6:47 AM	0.909	0.908	0.702	1101	1100	1101	1101	1100
14	11/16/01 8:43 AM	0.907	0.907	0.702	1101	1100	1101	1100	1100
15	11/16/01 10:40 AM	0.908	0.908	0.702	1050	1050	1050	1050	1000
16	11/16/01 12:36 PM	0.908	0.907	0.702	1051	1050	1050	1050	1000
17	11/16/01 2:33 PM	0.906	0.906	0.702	1051	1050	1050	1050	1000
18	11/16/01 4:29 PM	0.907	0.906	0.702	1050	1050	1050	1050	1000
19	11/16/01 6:26 PM	0.906	0.906	0.703	1050	1049	1050	1050	1000
20	11/16/01 8:22 PM	0.906	0.906	0.702	1051	1050	1051	1050	1000
21	11/16/01 10:19 PM	0.909	0.909	0.702	1051	1050	1051	1050	1000
22	11/17/01 12:15 AM	0.91	0.91	0.702	1051	1050	1051	1050	1000
23	11/17/01 2:12 AM	0.913	0.912	0.702	1051	1050	1051	1050	1000
24	11/17/01 4:08 AM	0.915	0.915	0.702	1051	1050	1050	1050	1000

Data | Pre Cat Left | Pre Cat Right | Post Cat | Left Exhaust Temp | Right Exhaust

Ready NUM

Data Log Spreadsheet
Figure 24



Data Log Chart
Figure 25

19. Start Up Procedure

1) Before starting the engine, make sure the AF900PC is powered up.

2) The following AF900PC parameters need to be set prior to starting engine. It is recommended to use the DynaHost user software main screen configuration (see section 10.3) for setting the following:

    - Manual Mode
    - Valve output = 100%
    - Gain = 50%
    - Reset = 50%
    - Post O2 sensor off

3) Since the AF900PC is in “Manual” mode and valve outputs are set to 100% or full open positions, the fuel pressure will be the same as it was before the AF900PC was installed.

4) Start the engine and allow to warm up to normal operating temperature.

5) Next, increase engine load to 100% or normal operating load.

6) Check the O2 sensor output voltage on each bank using either the front display or using the DynaHost user software. This will give an indication of where the engine has historically been running.

7) Set the O2 sensor setpoints to the same voltage read above.

8) Adjust the power screw adjustments on the carburetor(s) to full rich position. The O2 sensor output voltages should increase.

9) Decrease the manual output settings slowly by 5% decrements until the O2 sensor output voltages match close to the readings taken in step 6 above. Be careful not to lean the A/F too far as this could cause engine damage.

10) Switch to AF900PC **AUTO** mode. The AF900PC will now be controlling the output fuel valves so that the actual O2 sensor outputs match the setpoints.

11) Install an emissions analyzer in the exhaust and fine-tune the **LEFT BANK SP** and **RIGHT BANK SP** for the desired air/ fuel ratio. It is best to make small adjustments (no more than 10 mV at a time) and allow engine time to adjust before re-checking emissions.

12) The AF900PC will now control the air/fuel ratio to maintain the O2 sensor output voltage established by by tuning the **LEFT BANK SP** and **RIGHT BANK SP.**

When **CONTROL LIMIT** comes on during operation, it indicates that the AF900PC cannot apply sufficient valve movement to obtain the desired air/fuel ratio under the existing operating conditions. In this case, the engine's fuel pressure regulator spring or carburetor will have to be adjusted. If **CONTROL LIMIT** and **LEAN** are on, the AF900PC output fuel valve is wide open and cannot increase fuel flow to meet the O2 sensor setpoint. In this case the fuel pressure regulator spring pressure must be increased or the carburetor enriched. If **CONTROL LIMIT** and **RICH** are on, the AF900PC cannot decrease fuel flow enough to meet the O2 sensor setpoint. This would be unlikely and could be caused by a fuel valve malfunction.

20. Diagnostics

The AF900PC has powerful self-diagnostics to detect and properly deal with system and sensor faults. Below is a list of possible faults for which trips can be enabled:

Post-Catalyst O_2 Sensor Fault Param #7093	Sensor reading is outside normal range of 0 – 1V
Post-Catalyst O_2 Sensor Health Param #950	Sensor health is degraded – time to replace
Post-Catalyst Thermocouple Fault Param #7094	Thermocouple open or reading is outside valid range
Post-Catalyst Temperature Low Param #7025	Temperature after the catalytic converter is too low
Post-Catalyst Compensation Limit Param #7096	The post-catalyst compensation is at its maximum
Left Bank Pre-Catalyst O_2 Sensor Fault Param #7232.1	Sensor reading is outside normal range of 0 – 1V.
Left Bank Pre-Catalyst O_2 Sensor Health Param #950.1	Sensor health is degraded – time to replace.
Left Bank Pre-Catalyst Thermocouple Fault Param #7233.1	Thermocouple open or reading is outside valid range.
Left Bank Pre-Catalyst Temperature Low Param #7120.1	Temperature before the catalytic converter on left bank is too low

Left Bank Pre-Catalyst Output Low Param #7241.1	The left bank pre-catalyst control output is at its low limit.
Left Bank Pre-Catalyst Output High Param #7243	The left bank pre-catalyst control output is at its minimum limit
Right Bank Pre-Catalyst O_2 Sensor Fault Param #7232.2	Sensor reading is outside normal range of 0 – 1V
Right Bank Pre-Catalyst O_2 Sensor Health Param #950.2	Sensor health is degraded – time to replace
Right Bank Pre-Catalyst Thermocouple Fault Param #7233.2	Thermocouple open or reading is outside valid range
Right Bank Pre-Catalyst Temperature Low Param #7120.2	Temperature before the catalytic converter on right bank is too low
Right Bank Pre-Catalyst Output Low Param #7241.2	The right bank pre-catalyst control output is at its low limit
Right Bank Pre-Catalyst Output High Param #7243.2	The right bank pre-catalyst control output is at its minimum limit

Pre-Catalyst Thermocouple Fault Param #7265	Thermocouple open or reading is outside valid range
Pre- Catalyst Temperature Low Param #7251	Temperature after the catalytic converter is too low
Left Bank Intake Manifold Temperature Sensor Fault, Param #7407.1	Left bank sensor reading is outside normal range of 4 – 20mA
Right Bank Intake Manifold Temperature Sensor Fault, Param #7407.2	Right bank sensor reading is outside normal range of 4 – 20mA
Catalytic Converter Temperature Difference Too Low, Param #7267	The temperature difference between the inlet and outlet of the ctalytic converter is too small, indicating that the catalyst is not working properly to reduce emissions
Catalytic Converter Temperature Difference Too High, Param #7268	The temperature difference between the inlet and outlet of the catalytic converter is too large, indicating something is wrong with the catalytic converter such as it might be plugged.

21. APPENDIX A.

lExample of a Configuration File (AF900PC.SPC)

```
; Filename : AF900PC.SPC
; Date     : 2002/03/11
;*****************************************************************************
; (1) This template download file is used to configure a Dynalco AF900PC.
;     Copies of this file may be downloaded from the Dynalco Controls website
;     (www.dynalco.com).
; (2) Desired configuration values should be entered in all appropriate
;     fields before downloading to the AF900PC.  The default value for
;     each configuration variable is set as the initial download value.
; (3) Comments are included for each configuration variable to explain the
;     purpose and programmable values associated with each variable.
;*************************************************
; *************************************************
; ****************** PASSWORD ********************
; *************************************************

; SETUP PASSWORD ********************************
;   Selects the password for entering front-
;   panel AF900PC SETUP Mode.
;
;   The password may be up to eight (8)
;   characters in length.  The password must
;   contain ONLY the digit characters '1',
;   '2', '3', or '4'.  If any other characters
;   are used, no user will be able to enter
;   front-panel AF900PC SETUP Mode.
;
;   This password is ONLY required to
;   configure the AF900PC through the
;   front-panel.  NO password is required
;   to download a configuration file to
;   the AF900PC.
6112.0=1234

; SETUP PASSWORD ACTIVE TIME **********************
;   Selects the active time for the front-
;   panel SETUP Password.  This is the time
;   that the password remains active AFTER
;   a user has exited front-panel AF900PC
;   SETUP Mode.  This allows a user to re-
;   enter SETUP Mode WITHOUT having to re-
;   enter the password.
;
;     Min Val                     Max Val
;        30   ->  60 (default) ->   300   (in seconds)
6101=60
```

```
/*$PAGE*/
; ************************************************
; ******************** RELAYS ********************
; ************************************************

; TRIP RELAY ACTION ******************************
;       0  Normally Energized   (default)
;       1  Normally Deenergized
63102.1=1       ; ALARM    RELAY
63102.2=1       ; SHUTDOWN RELAY
63102.3=1       ; AUX      RELAY


; ************************************************
; ********************* RPM **********************
; ************************************************

; RPM NUMBER TEETH *******************************
;   Number teeth/holes on flywheel.
;
;     Min Val                     Max Val
;        4    -> 60 (default) ->   500   (in teeth)
9004.0=60

; RPM AVERAGING FILTER ***************************
;   Averages new RPM readings into current
;   RPM value by the following equation:
;
;   RPM = [RPM_previous * (1 - filter)] + [RPM_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.10 (default) ->   1.00  (no units)
9003.0=0.10

; RPM INPUT SELECT *******************************
;   Select RPM Input Source.
;       0  Magnetic Pickup (default)
;       1  Run Contacts
155=0

; START RPM **************************************
;   Maximum RPM allowed while making changes
;   to RPM Tooth number.
;
;
```

```
;     Min Val                     Max Val
;        25   -> 50 (default) ->  9999   (in RPM)
151=50

; START RPM HYSTERESIS ***************************
;   Start RPM hysteresis to re-enable RPM Tooth number
;   changes once Start RPM is reached.
;
;     Min Val    Max Val
;        0    ->   25 (default)  (in RPM)
;
;   Example:
;       If Start RPM  = 50 RPM &
;          Start Hyst = 20 RPM
;       then RPM tooth changes DISABLED > 50 RPM
;                         but re-ENABLED  < 30 RPM
;                                (50 - 20 = 30 RPM)
152=25

; START DELAY ************************************
;   Delay, after Start RPM reached or Run Contacts
;   CLOSED, before RUN state.
;
;     Min Val                       Max Val
;         0   ->  30 (default) ->   300   (in seconds)
153=30

;
```

```
/*$PAGE*/
; ************************************************
; ************* OXYGEN SENSOR HEALTH **************
; ************************************************

; SENSOR HEALTH FAULT PERCENTAGE ******************
;   Minimum Sensor Health Percentage before fault.
;
;     Min Val    Max Val
;       0.0   ->  100.0  (default) (in health %)
952.1=100.0     ; <LEFT  BANK O2 SENSOR>
952.2=100.0     ; <RIGHT BANK O2 SENSOR>
952.3=100.0     ; <POSTCAT    O2 SENSOR>

; SENSOR HEALTH AVERAGING FILTER ******************
;   Averages new Sensor Health readings into
;   current Sensor Health value by the following
;   equation:
;
;   SensorHealth = [SensorHealth_previous * (1 - filter)] +
;                  [SensorHealth_read     *      filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new Sensor Health readings at
;   all.
;
;   Slower filter values take longer to
;   settle to the current Sensor Health
;   but have a high noise rejection and
;   stability.  Faster filter values settle
;   quickly but have low noise rejection
;   and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.01 (default) ->   1.00  (no units)
957.1=0.01      ; <LEFT  BANK O2 SENSOR>
957.2=0.01      ; <RIGHT BANK O2 SENSOR>
957.3=0.01      ; <POSTCAT    O2 SENSOR>

; SENSOR HEALTH TEST TIME ************************
;   Time between Oxygen Sensor Health tests.
;
;     Min Val                     Max Val
;        10   ->  60 (default) ->   300   (in seconds)
970=60




;
```

```
/*$PAGE*/
; ************************************************
; ************* ANALOG INPUT CHANNELS *************
; ************************************************

; ***************** AI CHANNEL #01 ****************
; L PRE CAT O2 ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.1=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.1=0.05
```

```
; ***************** AI CHANNEL #02 ***************
; R PRE CAT O2 *********************************

; AI CHANNEL ENABLE ****************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.2=1

; AI CHANNEL FILTER ****************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                      Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.2=0.05




;
```

```
/*$PAGE*/
; ***************** AI CHANNEL #03 ***************
; POSTCAT O2 ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.3=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.3=0.05




;
```

```
/*$PAGE*/
; ***************** AI CHANNEL #04 ****************
; L MAP ***************************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.4=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.4=0.05

; AI CHANNEL MINIMUM UNITS ***********************
;
;     Min Val                       Max Val
;    -10000.0  -> 0.0 (default) -> 10000.0 (in PSIG)
5532.4=0

; AI CHANNEL MAXIMUM UNITS ***********************
;
;     Min Val                       Max Val
;      -50.0  -> 15.0 (default) ->   50.0  (in PSIG)
5533.4=15
```

```
; ***************** AI CHANNEL #05 ***************
; R MAP ****************************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.5=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.5=0.05

; AI CHANNEL MINIMUM UNITS ***********************
;
;     Min Val                       Max Val
;    -10000.0  -> 0.0 (default) -> 10000.0 (in PSIG)
5532.5=0

; AI CHANNEL MAXIMUM UNITS ***********************
;
;     Min Val                       Max Val
;      -50.0  -> 15.0 (default) ->   50.0  (in PSIG)
5533.5=15




;
```

```
/*$PAGE*/
; ***************** AI CHANNEL #09 ****************
; PRE CAT TEMP ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.9=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.9=0.05
```

```
; ***************** AI CHANNEL #10 ****************
; POSTCAT TEMP ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.10=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.10=0.05




;
```

```
/*$PAGE*/
; ***************** AI CHANNEL #11 ****************
; L EXHST TEMP ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.11=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.11=0.05




; ***************** AI CHANNEL #12 ****************
; R EXHST TEMP ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.12=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
```

```
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.12=0.05




;/*$PAGE*/
; ***************** AI CHANNEL #13 ****************
; L MANF  TEMP ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.13=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.13=0.05




; ***************** AI CHANNEL #14 ****************
; R MANF  TEMP ***********************************

; AI CHANNEL ENABLE ******************************
;       0  DISABLED
;       1  ENABLED  (default)
5500.14=1

; AI CHANNEL FILTER ******************************
;   Averages new AI channel readings into
```

```
;   current AI channel value by the following
;   equation:
;
;   Value = [Value_previous * (1 - filter)] + [Value_read * filter]
;
;   Filter values near to 1.00 pass new
;   readings very quickly.  Filter values
;   near to 0.00 pass new readings very
;   slowly.  A filter value of 0.00 does
;   NOT pass new RPM readings at all.
;
;   Slower filter values take longer to
;   settle to the current RPM but have a
;   high noise rejection and stability.
;   Faster filter values settle quickly but
;   have low noise rejection and stability.
;
;     Min Val                       Max Val
;       0.00  -> 0.05 (default) ->   1.00  (no units)
5516.14=0.05




;/*$PAGE*/
; ************************************************
; *************** TRIP CHANNELS ******************
; ************************************************

; *************** TRIP CHANNEL #01 ***************
; POSTCAT OXYGEN SENSOR FAULT *********************
;   Fault on bad sensor OR sensor NOT detected.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.1=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.1=0




; *************** TRIP CHANNEL #02 ***************
; POSTCAT OXYGEN SENSOR HEALTH ********************
;   Fault on low sensor health.
;   See OXYGEN SENSOR HEALTH section.
```

```
; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.2=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.2=0




; *************** TRIP CHANNEL #03 ***************
; POSTCAT TEMPERATURE SENSOR FAULT ***************
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.3=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.3=0




;
```

```
/*$PAGE*/
; *************** TRIP CHANNEL #04 ****************
; POSTCAT TEMPERATURE LOW  FAULT ******************
;   Fault on LOW  PostCat Temperature.
;
;     Min Val                     Max Val
;         0   -> 600 (default) ->  2500   (in degrees F)
7026=600

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.4=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.4=0




; *************** TRIP CHANNEL #05 ****************
; POSTCAT TEMPERATURE HIGH FAULT ******************
;   Fault on HIGH PostCat Temperature.
;
;     Min Val    Max Val
;         0   ->  2500   (default) (in degrees F)
7027=2500

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.5=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.5=0
```

```
; *************** TRIP CHANNEL #06 ****************
; POSTCAT COMPENSATION LIMITED ********************
;   Fault on PostCat Compensation at minimum/maximum.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.6=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.6=0



;/*$PAGE*/
; *************** TRIP CHANNEL #07 ****************
; PRECAT LEFT  BANK OXYGEN SENSOR FAULT ************
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.7=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.7=0
```

```
; *************** TRIP CHANNEL #08 ****************
; PRECAT LEFT  BANK OXYGEN SENSOR HEALTH **********
;   Fault on low sensor health.
;   See OXYGEN SENSOR HEALTH section.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.8=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.8=0




; *************** TRIP CHANNEL #09 ****************
; PRECAT LEFT  BANK EXHAUST TEMPERATURE SENSOR FAULT
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.9=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.9=0




;
```

```
/*$PAGE*/
; *************** TRIP CHANNEL #10 ****************
; PRECAT LEFT  BANK EXHAUST TEMPERATURE LOW  FAULT
;   Fault on LOW  PreCat Exhaust Temperature.
;
;     Min Val                     Max Val
;         0   -> 575 (default) ->  2000   (in degrees F)
7211.1=575

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.10=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.10=0




; *************** TRIP CHANNEL #11 ****************
; PRECAT LEFT  BANK EXHAUST TEMPERATURE HIGH FAULT
;   Fault on HIGH PreCat Exhaust Temperature.
;
;     Min Val    Max Val
;         0   ->  2500   (default) (in degrees F)
7121.1=2500

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.11=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.11=0
```

```
; *************** TRIP CHANNEL #12 ****************
; PRECAT LEFT  BANK INTAKE  TEMPERATURE HIGH FAULT
;   Fault on HIGH PreCat Intake Manifold Temperature.
;
;     Min Val    Max Val
;         0   ->  2500   (default) (in degrees F)
7116.1=2500

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.12=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.12=0



;/*$PAGE*/
; *************** TRIP CHANNEL #13 ****************
; PRECAT LEFT  BANK VALVE LOW  LIMITED
;   Fault on PreCat Valve stuck at minimum opening.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.13=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.13=0
```

```
; *************** TRIP CHANNEL #14 ****************
; PRECAT LEFT  BANK VALVE HIGH LIMITED
;   Fault on PreCat Valve stuck at maximum opening.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.14=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.14=0

;/*$PAGE*/
; *************** TRIP CHANNEL #15 ****************
; PRECAT RIGHT BANK OXYGEN SENSOR FAULT ***********
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.15=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.15=0


; *************** TRIP CHANNEL #16 ****************
; PRECAT RIGHT BANK OXYGEN SENSOR HEALTH **********
;   Fault on low sensor health.
;   See OXYGEN SENSOR HEALTH section.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.16=0
```

```
; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.16=0



; *************** TRIP CHANNEL #17 ****************
; PRECAT RIGHT BANK EXHAUST TEMPERATURE SENSOR FAULT
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ***********************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.17=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.17=0




;/*$PAGE*/
; *************** TRIP CHANNEL #18 ****************
; PRECAT RIGHT BANK EXHAUST TEMPERATURE LOW  FAULT
;   Fault on LOW  PreCat Exhaust Temperature.
;
;     Min Val                     Max Val
;         0   -> 575 (default) ->  2000   (in degrees F)
7211.2=575

; TRIP MODE ***********************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.18=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.18=0
```

```
; *************** TRIP CHANNEL #19 ****************
; PRECAT RIGHT BANK EXHAUST TEMPERATURE HIGH FAULT
;   Fault on HIGH PreCat Exhaust Temperature.
;
;     Min Val    Max Val
;         0   ->  2500   (default) (in degrees F)
7121.2=2500

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.19=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.19=0



; *************** TRIP CHANNEL #20 ****************
; PRECAT RIGHT BANK INTAKE  TEMPERATURE HIGH FAULT
;   Fault on HIGH PreCat Intake Manifold Temperature.
;
;     Min Val    Max Val
;         0   ->  2500   (default) (in degrees F)
7116.2=2500

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.20=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.20=0



;
```

```
/*$PAGE*/
; *************** TRIP CHANNEL #21 ****************
; PRECAT RIGHT BANK VALVE LOW  LIMITED
;   Fault on PreCat Valve stuck at minimum opening.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.21=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.21=0




; *************** TRIP CHANNEL #22 ****************
; PRECAT RIGHT BANK VALVE HIGH LIMITED
;   Fault on PreCat Valve stuck at maximum opening.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.22=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.22=0



;
```

```
/*$PAGE*/
; *************** TRIP CHANNEL #23 ****************
; PRECAT TEMPERATURE SENSOR FAULT *****************
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.23=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.23=0




; *************** TRIP CHANNEL #24 ****************
; PRECAT TEMPERATURE LOW  FAULT *******************
;   Fault on LOW  PreCat Temperature.
;
;     Min Val                       Max Val
;         0   -> 1000 (default) ->  2000   (in degrees F)
7252=1000

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.24=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.24=0


; *************** TRIP CHANNEL #25 ****************
; PRECAT TEMPERATURE HIGH FAULT *******************
;   Fault on HIGH PreCat Temperature.
;
;     Min Val    Max Val
;         0   ->  2500   (default) (in degrees F)
7253=2500
```

```
; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.25=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.25=0


;/*$PAGE*/
; POSTCAT/PRECAT TEMPERATURE DELTA FAULT FILTER ***
;   Averages new Delta Temperature readings into
;   current Delta Temperature by the following equation:
;
;   Delta_Temp = [Delta_Temp_previous * (1 - filter)] +
;                [Delta_Temp_read     *      filter]
;
;   Large filter values near to 1.00 pass new readings
;   very quickly.  Small filter values pass new readings
;   very slowly.  The following lists examples of the
;   expected time lag between the instantaneous Delta
;   Temperature & the Filtered Delta Temperature for
;   given filter values (for a 20 deg F delta):
;
;       Filter                  Time Delay
;       Value      (seconds)    (minutes)      (hours)
;      ---------  ------------------------------------
;      0.01           37 sec =    0.61 min =  0.010 hrs
;      0.001         369 sec =    6.15 min =  0.102 hrs
;      0.0001       3689 sec =   61.48 min =  1.025 hrs
;      0.00005      7377 sec =  122.96 min =  2.049 hrs
;      0.00001     36887 sec =  614.78 min = 10.246 hrs
;      0.000005    73774 sec = 1229.57 min = 20.493 hrs
;      0.0000025  147548 sec = 2459.13 min = 40.986 hrs
;
;     Min Val                           Max Val
;    0.0000025 -> 0.0001 (default) ->  0.01   (no units)
726=0.0001


; *************** TRIP CHANNEL #26 ****************
; POSTCAT/PRECAT TEMPERATURE DELTA LOW  FAULT *****
;   Fault if PostCat/PreCat Temperature difference
;   less    than LOW  Delta threshold.
;
;     Min Val              Max Val
;         0   (default) ->  2500   (in degrees F)
7256=0
```

```
; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.26=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.26=0




; *************** TRIP CHANNEL #27 ****************
; POSTCAT/PRECAT TEMPERATURE DELTA HIGH FAULT *****
;   Fault if PostCat/PreCat Temperature difference
;   greater than HIGH Delta threshold.
;
;     Min Val    Max Val
;         0   ->  2500   (default) (in degrees F)
7257=2500

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.27=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.27=0



;
```

```
/*$PAGE*/
; *************** TRIP CHANNEL #28 ****************
; PRECAT LEFT  BANK INTAKE MANIFOLD PRESSURE SENSOR FAULT
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.28=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.28=0




; *************** TRIP CHANNEL #29 ****************
; PRECAT RIGHT BANK INTAKE MANIFOLD PRESSURE SENSOR FAULT
;   Fault on bad sensor OR sensor NOT detected.
;   NOT applicable if sensor channel DISABLED.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.29=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.29=0




;
```

```
/*$PAGE*/
; *************** TRIP CHANNEL #30 ****************
; PRECAT LEFT  BANK VALVE SENSE LOW  FAULT ********
;   Fault on bad LOW  Valve sense.

; TRIP ENABLE ***********************************
;   Select minimum controlled valve opening setpoint.
;
;   When controller outputs valve opening % above this
;   setpoint, LOW VALVE SENSE TRIP is ENABLED; below
;   this setpoint, TRIP is DISABLED.
;
;   Thus, a LOW VALVE SENSE TRIP is recognized when
;   the controller outputs a valve opening greater
;   than the setpoint but a valve low current condition
;   is detected; the TRIP is ignored when the controller
;   intentionally outputs a low valve opening.
;
;   Examples:
;
;    1) Controller @ Startup outputs 10% valve opening
;       --> LOW VALVE SENSE TRIP DISABLED b/c controller
;           valve output of 10% is less than 35% setpoint
;
;    2) Controller @ Run     outputs 55% valve opening
;       --> LOW VALVE SENSE TRIP ENABLED  b/c controller
;           valve output of 55% is greater than setpoint
;           If valve low current condition detected,
;           LOW VALVE SENSE TRIP is recognized
;
;     Min Val                     Max Val
;         0   -> 35 (default) ->   100   (in valve opening %)
640.1=35

; TRIP MODE *************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.30=0

; TRIP LOG ENABLE *******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.30=0
```

```
; *************** TRIP CHANNEL #31 ****************
; PRECAT LEFT  BANK VALVE SENSE HIGH FAULT ********
;   Fault on bad HIGH Valve sense.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.31=0

; TRIP LOG ENABLE ********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.31=0




;
```

```
/*$PAGE*/
; *************** TRIP CHANNEL #32 ****************
; PRECAT RIGHT BANK VALVE SENSE LOW  FAULT ********
;   Fault on bad LOW  Valve sense.

; TRIP ENABLE ***********************************
;   Select minimum controlled valve opening setpoint.
;
;   When controller outputs valve opening % above this
;   setpoint, LOW VALVE SENSE TRIP is ENABLED; below
;   this setpoint, TRIP is DISABLED.
;
;   Thus, a LOW VALVE SENSE TRIP is recognized when
;   the controller outputs a valve opening greater
;   than the setpoint but a valve low current condition
;   is detected; the TRIP is ignored when the controller
;   intentionally outputs a low valve opening.
;
;   Examples:
;
;    1) Controller @ Startup outputs 10% valve opening
;       --> LOW VALVE SENSE TRIP DISABLED b/c controller
;           valve output of 10% is less than 35% setpoint
;
;    2) Controller @ Run     outputs 55% valve opening
;       --> LOW VALVE SENSE TRIP ENABLED  b/c controller
;           valve output of 55% is greater than setpoint
;           If valve low current condition detected,
;           LOW VALVE SENSE TRIP is recognized
;
;     Min Val                     Max Val
;         0   -> 35 (default) ->   100   (in valve opening %)
640.2=35

; TRIP MODE *************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.32=0

; TRIP LOG ENABLE *********************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.32=0




; *************** TRIP CHANNEL #33 ****************
; PRECAT RIGHT BANK VALVE SENSE HIGH FAULT ********
;   Fault on bad HIGH Valve sense.
```

```
; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.33=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.33=0

/*$PAGE*/
; *************** TRIP CHANNEL #34 ****************
; HEATER VALVE SENSE LOW  FAULT ******************
;   Fault on bad LOW  Valve sense.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.34=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.34=0

; *************** TRIP CHANNEL #35 ****************
; HEATER VALVE SENSE HIGH FAULT ******************
;   Fault on bad HIGH Valve sense.

; TRIP MODE ************************************
;   Select TRIP Relay to activate on channel fault.
;
;       0  DISABLED       (default)
;       1  ALARM    RELAY
;       2  SHUTDOWN RELAY
;       3  AUX      RELAY
600.35=0

; TRIP LOG ENABLE ******************************
;   Trigger asynchronous LOG on channel fault.
;
;       0  DISABLED (default)
;       1  ENABLED
601.35=0
```

```
/*$PAGE*/
; ************************************************
; *************** AIR/FUEL CONTROL ***************
; ************************************************

; AFC MODE ************************************
;   Select Air/Fuel Control Mode.
;
;       0  MANUAL
;       1  AUTO   (default)
7000=0


; POSTCAT/PRECAT TEMPERATURE DIFFERENCE ENABLE ****
;       0  DISABLED
;       1  ENABLED  (default)
7250=1

; POSTCAT/PRECAT TEMPERATURE DIFFERENCE FAULT DELAY
;   Delay between PostCat/PreCat Temperature Delta
;   Fault and fault action.
;
;     Min Val                     Max Val
;         0   -> 10 (default) ->   240   (in minutes)
7258=10


; HEATER ENABLE *********************************
;       0  DISABLED
;       1  ENABLED  (default)
7300=1




; ******************** POSTCAT *******************

; POSTCAT ENABLE ********************************
;       0  DISABLED (default)
;       1  ENABLED
7010=1

; POSTCAT SETPOINT ******************************
;   PostCat Oxygen Sensor Setpoint.
;
;     Min Val                       Max Val
;      0.000  -> 0.702 (default) ->  1.000  (in Volts)
7031=0.702

; POSTCAT SETPOINT SELECT ************************
;   Select PostCat Setpoint Source.
;
;       0  Requested       Setpoint Request (default)
;       1  MAP Programming Setpoint (if MAP sensors ENABLED)
7033=0

;
```

```
/*$PAGE*/
; *************** PRECAT LEFT  BANK ***************

; PRECAT BANK ENABLE ******************************
;       1  ENABLED (default)
7100.1=1

; PRECAT BANK OXYGEN SENSOR FAULT ACTION **********
;   Select Valve Output when Oxygen Sensor faults.
;
;       0  Output               Fault Percent (default)
;       1  Output Opposite Bank Valve Percent
;       2  MAP Programming Table      Percent (if MAP sensors ENABLED)
7113.1=0


; PRECAT VALVE MANUAL OUTPUT **********************
;   Set Starting Valve Output.
;   Output valid when Bank ENABLED and at Run RPM
;   and in AFC MANUAL Mode.
;
;     Min Val              Max Val
;       0.0   (default) ->  100.0  (in valve opening %)
7184.1=0.0

; PRECAT VALVE START  OUTPUT **********************
;   Set Starting Valve Output.
;   Output valid when Bank ENABLED and at Run RPM
;   and in AFC AUTO   Mode.
;
;     Min Val              Max Val
;       0.0   (default) ->  100.0  (in valve opening %)
7185.1=0.0

; PRECAT VALVE FAULT  OUTPUT **********************
;   Set Starting Valve Output.
;   Output valid when Bank ENABLED and at Run RPM
;   and in AFC AUTO   Mode and Oxygen Sensor faulted
;   and Sensor Fault Action set to Fault Percent.
;
;     Min Val              Max Val
;       0.0   (default) ->  100.0  (in valve opening %)
7186.1=0.0


;
```

```
/*$PAGE*/
; PRECAT BANK SETPOINT ***************************
;   PreCat Oxygen Sensor Setpoint.
;
;     Min Val                         Max Val
;      0.000  -> 0.840 (default) ->  1.000  (in Volts)
7151.1=0.840

; PRECAT BANK SETPOINT RATE **********************
;   PreCat Oxygen Sensor Setpoint Rate Limiting.
;
;     Min Val    Max Val
;      0.000  -> 10.000  (default) (in Volts/second)
7153.1=10.000


; PRECAT BANK PROPORTIONAL GAIN ******************
;   Set Proportional Gain.
;
;     Min Val                       Max Val
;       0.00  -> 2.00 (default) ->  10.00  (no units)
7172.1=2.00

; PRECAT BANK INTEGRAL GAIN **********************
;   Set Integral Gain Reset Time.
;
;     Min Val                       Max Val
;       0.1   -> 10.0 (default) ->  60.0   (no units)
7175.1=10.0


; PRECAT BANK SLOW/FAST DYNAMICS ENABLE ***********
;       0  DISABLED (default)
;       1  ENABLED
7166.1=0

; PRECAT BANK SLOW/FAST DYNAMICS POSITIVE GAIN ****
;   Set Positive Gain.
;
;     Min Val                       Max Val
;       0.01  -> 1.00 (default) ->  10.00  (no units)
7162.1=1.00

; PRECAT BANK SLOW/FAST DYNAMICS NEGATIVE GAIN ****
;   Set Negative Gain.
;
;     Min Val                       Max Val
;       0.01  -> 1.00 (default) ->  10.00  (no units)
7163.1=1.00

; PRECAT BANK SLOW/FAST DYNAMICS SLOW THRESHOLD ***
;   Set SLOW/LOW  Threshold.
;
;     Min Val    Max Val
;      0.000  ->  1.000  (default) (in Volts)
7164.1=1.00
```

```
; PRECAT BANK SLOW/FAST DYNAMICS FAST THRESHOLD ***
;   Set FAST/HIGH Threshold.
;
;     Min Val    Max Val
;      0.000  ->  1.000  (default) (in Volts)
7165.1=1.00




;/*$PAGE*/
; *************** PRECAT RIGHT BANK ***************

; PRECAT BANK ENABLE ******************************
;       0  DISABLED (default)
;       1  ENABLED
7100.2=0

; PRECAT BANK OXYGEN SENSOR FAULT ACTION **********
;   Select Valve Output when Oxygen Sensor faults.
;
;       0  Output               Fault Percent (default)
;       1  Output Opposite Bank Valve Percent
;       2  MAP Programming Table      Percent (if MAP sensors ENABLED)
7113.2=0


; PRECAT VALVE MANUAL OUTPUT **********************
;   Set Starting Valve Output.
;   Output valid when Bank ENABLED and at Run RPM
;   and in AFC MANUAL Mode.
;
;     Min Val              Max Val
;       0.0   (default) ->  100.0  (in valve opening %)
7184.2=0.0

; PRECAT VALVE START  OUTPUT **********************
;   Set Starting Valve Output.
;   Output valid when Bank ENABLED and at Run RPM
;   and in AFC AUTO   Mode.
;
;     Min Val              Max Val
;       0.0   (default) ->  100.0  (in valve opening %)
7185.2=0.0

; PRECAT VALVE FAULT  OUTPUT **********************
;   Set Starting Valve Output.
;   Output valid when Bank ENABLED and at Run RPM
;   and in AFC AUTO   Mode and Oxygen Sensor faulted
;   and Sensor Fault Action set to Fault Percent.
;
;     Min Val              Max Val
;       0.0   (default) ->  100.0  (in valve opening %)
7186.2=0.0


;
```

```
/*$PAGE*/
; PRECAT BANK SETPOINT ***************************
;   PreCat Oxygen Sensor Setpoint.
;
;     Min Val                         Max Val
;      0.000  -> 0.840 (default) ->  1.000  (in Volts)
7151.2=0.840

; PRECAT BANK SETPOINT RATE **********************
;   PreCat Oxygen Sensor Setpoint Rate Limiting.
;
;     Min Val    Max Val
;      0.000  -> 10.000  (default) (in Volts/second)
7153.2=10.000


; PRECAT BANK PROPORTIONAL GAIN ******************
;   Set Proportional Gain.
;
;     Min Val                       Max Val
;       0.00  -> 2.00 (default) ->  10.00  (no units)
7172.2=2.00

; PRECAT BANK INTEGRAL GAIN **********************
;   Set Integral Gain Reset Time.
;
;     Min Val                       Max Val
;       0.1   -> 10.0 (default) ->  60.0   (no units)
7175.2=10.0


; PRECAT BANK SLOW/FAST DYNAMICS ENABLE ***********
;       0  DISABLED (default)
;       1  ENABLED
7166.2=0

; PRECAT BANK SLOW/FAST DYNAMICS POSITIVE GAIN ****
;   Set Positive Gain.
;
;     Min Val                       Max Val
;       0.01  -> 1.00 (default) ->  10.00  (no units)
7162.2=1.00

; PRECAT BANK SLOW/FAST DYNAMICS NEGATIVE GAIN ****
;   Set Negative Gain.
;
;     Min Val                       Max Val
;       0.01  -> 1.00 (default) ->  10.00  (no units)
7163.2=1.00

; PRECAT BANK SLOW/FAST DYNAMICS SLOW THRESHOLD ***
;   Set SLOW/LOW  Threshold.
;
;     Min Val    Max Val
;      0.000  ->  1.000  (default) (in Volts)
7164.2=1.00
```

```
; PRECAT BANK SLOW/FAST DYNAMICS FAST THRESHOLD ***
;   Set FAST/HIGH Threshold.
;
;     Min Val    Max Val
;      0.000  ->  1.000  (default) (in Volts)
7165.2=1.00



;/*$PAGE*/
; ************************************************
; *************** LOG PARAMETERS *****************
; ************************************************

; *************** LOG PARAMETER #00 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.0=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.0=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.0=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.0=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.0=0

;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #01 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.1=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.1=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.1=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.1=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.1=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #02 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.2=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.2=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.2=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.2=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.2=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #03 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.3=

; LOG ENABLE ***********************************
;       0  DISABLED (default)
;       1  ENABLED
135.3=0

; LOG GRAPH NUMBER *****************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.3=0

; LOG PARAMETER NUMBER *************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.3=0

; LOG PARAMETER INDEX **************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.3=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #04 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.4=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.4=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.4=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.4=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.4=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #05 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.5=

; LOG ENABLE ***********************************
;       0  DISABLED (default)
;       1  ENABLED
135.5=0

; LOG GRAPH NUMBER *****************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.5=0

; LOG PARAMETER NUMBER *************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.5=0

; LOG PARAMETER INDEX **************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.5=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #06 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.6=

; LOG ENABLE ***********************************
;       0  DISABLED (default)
;       1  ENABLED
135.6=0

; LOG GRAPH NUMBER *****************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.6=0

; LOG PARAMETER NUMBER *************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.6=0

; LOG PARAMETER INDEX **************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.6=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #07 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.7=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.7=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.7=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.7=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.7=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #08 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.8=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.8=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.8=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.8=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.8=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #09 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.9=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.9=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.9=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.9=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.9=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #10 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.10=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.10=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.10=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.10=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.10=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #11 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.11=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.11=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.11=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.11=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.11=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #12 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.12=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.12=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.12=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.12=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.12=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #13 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.13=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.13=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.13=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.13=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.13=0




;
```

```
/*$PAGE*/
; *************** LOG PARAMETER #14 ***************

; LOG NAME ************************************
;   User-defined alphanumeric name up to 20 characters
;   in length.
;
;      <BLANK> (default)
138.14=

; LOG ENABLE **********************************
;       0  DISABLED (default)
;       1  ENABLED
135.14=0

; LOG GRAPH NUMBER ******************************
;   Select specific graph number to plot data in
;   Excel chart.  When the same graph number is
;   set for multiple log parameters, then these
;   log parameter values will be plotted on the
;   same Excel chart.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in graph #)
139.14=0

; LOG PARAMETER NUMBER ***************************
;   Set Parameter Number to log.
;
;     Min Val              Max Val
;         0   (default) ->  65535  (in parameter #)
136.14=0

; LOG PARAMETER INDEX ****************************
;   Set Parameter Index to log.
;   Indices used for multiple channel parameters.
;   If parameter is NOT a channel parameter, set
;   index value to 255.
;
;     Min Val              Max Val
;         0   (default) ->   255   (in parameter index #)
137.14=0
```

22. Modbus Addresses

These are all Floating-Point ModBus Numbers:
Note: Modbus Host must be setup for: Function Code 03, Device ID (address) = 1
Baud Rate = 19,200/ 8 Bits /No Parity/ 1 Stop Bit, Transmission Mode = Daniels RTU

Parameter 2321 = Node #

Name	Modbus Number
Left Bank Pre-Cat O2	7002
Right Bank Pre-Cat O2	7003
Post Cat O2	7004
Left Bank MAP	7005
Right Bank MAP	7006
Board I.D. (you don't need)	7007
4-20mA #3	7008
Raw Power	7009
Pre-Cat Temperature	7010
Post Cat Temp	7011
Left Bank Exh Temp	7012
Right Bank Exh Temp	7013
Left Bank Intk Manif. Temp	7014
Right Bank Intk Manif Temp	7015
CJC Temp (Ambient)	7016
4-20mA #4 (Catalyst Back Pressure)	7017

AF900PC Status (DynaHost Parameter 300): Request Address 0025, Length = 1, Function Code 03 to get:

APP_STATUS_DIS	0
APP_STATUS_MAN	1
APP_STATUS_STOP	2
APP_STATUS_WARMUP	3
APP_STATUS_START	4
APP_STATUS_AUTO	5
APP_STATUS_AUTO_POST	6
APP_STATUS_AUTO_FAULT	7

Alarm Index:

"NONE"	Ch #00	UNUSED
"POST O2 FLT "	Ch #01	PostCat O2 Sensor Fault
"POST O2 HLTH"	Ch #02	PostCat O2 Sensor Health
"POST TC FLT "	Ch #03	PostCat TC Fault
"POST TEMP LO"	Ch #04	PostCat TC Temp Low
"POST TEMP HI"	Ch #05	PostCat TC Temp High
"POST OUT LIM"	Ch #06	PostCat Out Limit
"L O2 FLT "	Ch #07	L Pre Cat O2 Sensor Fault
"L O2 HLTH"	Ch #08	L Pre Cat O2 Sensor Health
"L TC FLT "	Ch #09	L Exhaust TC Fault
"L EXH TEMP LO"	Ch #10	L Exhaust TC Temp Low
"L EXH TEMP HI"	Ch #11	L Exhaust TC Temp High
"L MNF TEMP HI"	Ch #12	L Manifold TC Temp High

"L OUT LO"	Ch #13	L Pre Cat Out Limit Low
"L OUT HI"	Ch #14	L Pre Cat Out Limit High
"R O2 FLT "	Ch #15	R Pre Cat O2 Sensor Fault
"R O2 HLTH"	Ch #16	R Pre Cat O2 Sensor Health
"R TC FLT "	Ch #17	R Exhaust TC Fault
"R EXH TEMP LO"	Ch #18	R Exhaust TC Temp Low
"R EXH TEMP HI"	Ch #19	R Exhaust TC Temp High
"R MNF TEMP HI"	Ch #20	R Manifold TC Temp High
"R OUT LO"	Ch #21	R Pre Cat Out Limit Low
"R OUT HI"	Ch #22	R Pre Cat Out Limit High
"PRE TC FLT "	Ch #23	Pre Cat TC Fault
"PRE TEMP LO"	Ch #24	Pre Cat TC Temp Low
"PRE TEMP HI"	Ch #25	Pre Cat TC Temp High
"DELTA TEMP LO"	Ch #26	Pre/Post TC Temp Low
"DELTA TEMP HI"	Ch #27	Pre/Post TC Temp High
"L MAP FLT"	Ch #28	L IMP Sensor Fault
"R MAP FLT"	Ch #29	R IMP Sensor Fault
"L CURRENT LO"	Ch #30	L Valve Current Low
"L CURRENT HI"	Ch #31	L Valve Current High
"R CURRENT LO"	Ch #32	R Valve Current Low
"R CURRENT HI"	Ch #33	R Valve Current High
"HEATER LO"	Ch #34	Heater Low
"HEATER HI"	Ch #35	Heater High
"SPARE ALM 1"	Ch #36	Spare 1
"SPARE ALM 2"	Ch #37	Spare 2
"SPARE ALM 3"	Ch #38	Spare 3
"SPARE ALM 4"	Ch #39	Spare 4